

Gold Usage and the Patent World

USE OF PATENTS AS A SOURCE OF TECHNOLOGICAL INFORMATION ON GOLD

Oskar A. Kunze

International Gold Corporation, Johannesburg, South Africa.

This article is not intended to be exhaustive either with regard to the featuring of gold in the patent literature, or in respect of patents, patent laws and their implications. The aim of the article is to review some of the interesting and informative facts encountered by the Intergold Information Service in compiling its bibliographic data bank on industrial gold uses and properties, and in publishing the review 'Gold Patent Digest'; perhaps this contribution might aid others searching the literature on gold industrial usage.

Recently the author had cause to order through the Intergold New York office a copy of a U.S. Government Patent Application relating to the use of gold in electronics. The reply telex read: 'The U.S. Government considers this patent as proprietary information and will not release any information on it'. Shortly afterwards it was realised that the complete patent specification of this invention had already been published and had in fact recently come into our possession.

This is not an isolated case of the type of confusion reigning in the information service world regarding protection rights. In a recent issue of *New Scientist* similar examples are given under the heading 'Details of 'secret' patents published' (1). These incidents are indicative of the wide-spread misconceptions which exist about patents and patent laws, of which secrecy is one. As a matter of fact, the very basis on which patent laws are built excludes any possibility of secrecy surrounding patent publications (indeed the word 'patent' derives from the Latin 'patere', meaning lay open to the public). This of course, does not exclude the existence of nebulous formulations in patents. However, it is doubtful that these could stand up in court to the rigours of litigation.

What are the patent laws? Their roots go back through centuries and the essence of the patent system is magnificently worded in an 1851 edict of the Austria-Hungarian Monarchy:

'The reform of the Empire makes it necessary to introduce laws for the stimulation of the inventive spirit in industry in these parts of the empire which hitherto had no such protection' (2).

Stimulation and Protection

How do patent laws stimulate and protect the inventive spirit? The intention is to achieve this by granting the inventor special rights regarding the exploitation of his invention in exchange for a total disclosure of the invention, i.e. making it available to the general public in order to stimulate the advent of better inventions. Thus, patent documents are readily available to everybody, and as far as the author could establish, no copyright protection exists for patent publications. It is therefore evident that should anybody wish to keep an invention secret, he may not resort to the patent system.

Patents, Yesterday and Today

The writer recently had the opportunity to search a unique collection of old patent documents, the collection of 90 000 'privileges' (*Privilegien*) from the years 1852 to 1899 at the Austrian

Patent Office in Vienna, for those which relate to gold usage. Some of these old patents (or privileges) are most interesting for historical reasons, and others demonstrate the essence of patent documentation in a more eloquent and picturesque way than do many modern releases. This is ably revealed in the example quoted below.

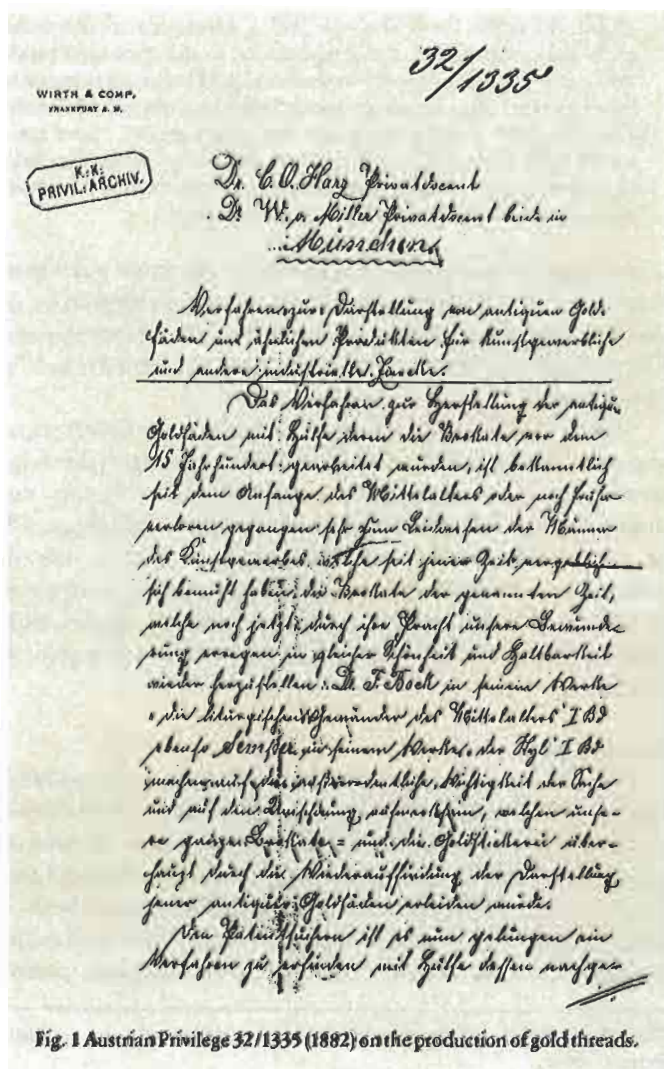


Fig. 1 Austrian Privilege 32/1335 (1882) on the production of gold threads.

Most patent documents contain ample information besides the description of the actual invention. Being a review of the prior art in its field, the patent is concerned with the reasons why the invention is adding something new to that field. This structure, which can be found in most patent publications, is beautifully illustrated in Figure 1* above, which shows the first page of privilege number 32/1335 granted in 1882, to Drs. C.O. Harz and W. von Miller, both of Munich. The document describes a 'Method for the Production of Antique Gold Threads and Similar Products for Arts and Crafts and Other Industrial Purposes', and is approximately translated as follows:

'As is well known, the technique of producing antique gold threads which were used in the working of brocades prior to the 15th century, has been lost since the beginning of the Middle Ages, or even earlier, this causing great distress to the men of arts and crafts since those times who have endeavoured in vain to recreate in their original beauty and durability these brocades, which even today compel our admiration by their splendour. Dr. F. Bock, in his books 'The Liturgical Robes of the Middle Ages', Vol. 1 and 'The Style', Vol. 1, draws our attention to the exceptional importance of this matter, and to the revolution which would take place in our entire brocade and gold embroidery industry by a rediscovery of the fabrication methods of these antique gold threads. The applicants (literally translated 'the patent seekers') have been successful in inventing a method which, as has been proved, can help in recreating gold threads of the same beauty and durability as those of the above-mentioned brocades of ancient times.'

It follows a method which essentially is the impregnation of animal membranes such as bladders or intestines with gold foil or powder or by galvanic means, and these are then cut into threads. The privilege structure is quite clear: Background, Prior Art and the Novel Process.

That this process was not so novel at the time is evident from an annexure (Figure 2) which states that, in 1885, the larger part of this patent, due to a complaint by a Theodor Graf of Vienna, was nullified, save for the parts which involve the electrolytic deposition of metal. However this privilege, whether valid or invalid, demonstrates the relatively standardized information pattern which is offered also by today's patents and patent applications, independent of whether or not a patent for the latter will be granted eventually.

Counterfeits

Gold, because of its value, has always been subject to fraud and forgery, and devices for detecting counterfeits of coins have thus of necessity been the subject of invention. Descriptions of those of yesterday and today make an interesting comparison. Figures 3 and 4 show two patent documents, dated over 100 years apart, both of which disclose devices which allow the detection of fake gold coins: Austrian Privilege VIII-409 of 1876 and European patent

*Reproduction of 'privileges' with the kind permission of the Austrian Patent Office.

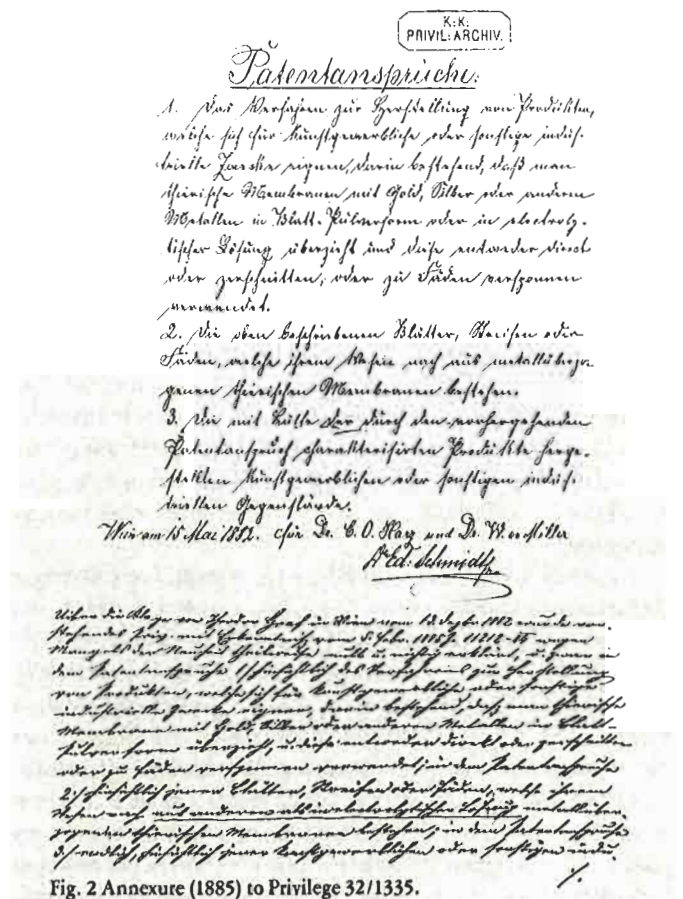


Fig. 2 Annexure (1885) to Privilege 32/1335.

application EP 113031 of 1984. A considerable difference in methods of operation is apparent: the former tests size and mass of coins, the latter the resonance frequencies and bars. Another interesting difference, however, is found in the introductory justification for the necessity for such instrumentation. The underlying reasons are given in similar manner in both documents, but it is the psychological aspect evident in the old patent which is fascinating. Not only is this inspection procedure constructed to examine the authenticity of coins, but one important aspect is that in the older patent this is to be done in a clandestine manner, undetected by the customer, in order not to reveal any suspicion:

'The device has the purpose of offering to the public a convenient method of checking any accepted gold coin rapidly for its authenticity and proper weight without the necessity of resorting to the gold scale which is not in common use in daily business transactions because it reveals suspicion, and it is time-consuming.'

Thus the described device had a slot from which authentic coins rolled into the cash box, and only fake coins were ejected into an open container, raising suspicion only when justified.

*Beschreibung des Apparates zur Aussonderung
falscher und mangelhafter Goldmünzen*

A. Bernstein in Berlin. PRIVILEGIUM

Der Apparat soll den Zweck, dem Publikum eine bequeme
Weise zu haben, auf die Goldstücke jedes in Europa gebräuchliche
Goldstück in Bezug auf dessen Gewicht und Vollständigkeit
zu prüfen. Die Goldstücke sollen in einem Gefäß zu versenken,
welches fest mit einem Wasserbehälter verbunden ist, und in
hohleren Gefäß mit Wasser gefüllt ist.

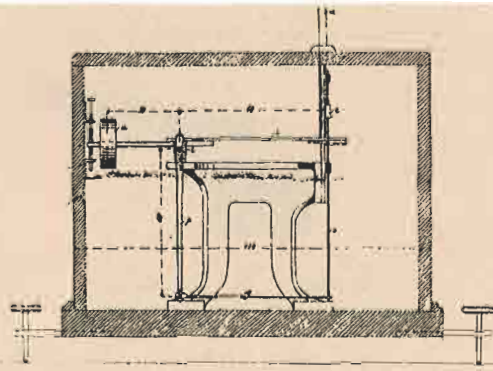
Der Apparat soll den Zweck haben zu zeigen,
ob ein Goldstück, welches man in eine tiefe bestimmte Gewichte
fallen lassen will, ob es sich vollständig ist, so bald in einem
bestimmten Wasserbehälter sinken wird, oder ob es sich nicht
jedoch das Goldstück eines falschen Gewichtes ist, und unvollständigen
Gewichte unvollständig ist, so bald es der Apparat nicht in der
Rasse sinken sondern es sich in einem bestimmten Wasserbehälter
aufschwimmen wird, so bald es sinken wird.

Die bestmögliche Vorrichtung stellt die kleine Röhren
(a) die Röhren im Wasser zu lassen (b) den Gefäß für die
fallen und unvollständigen Goldstücke dar.

Die Art und Weise, wie der Apparat seinen
Zweck erfüllt, ist wie folgt:

Wenn man ein Goldstück in die Gewichte
(a) fallen lässt, so wird es fallen in einem von zwei
Röhren (a. u. b.) in ein bestimmtes Wasser, in welchem ein
bestimmtes Wasser ist.

Die Röhren soll man so einrichten, dass sie mit einem
festen Wasserbehälter verbunden sind, und ein
bestimmtes Wasser (c), welche in eine Röhre mit



Maßstab 1:1

Vorrichtung

zum Sortiren von Goldmünzen.

A. Bernstein in Berlin.

Apparat für 20 Mark-Stücke

Handgezeichnet

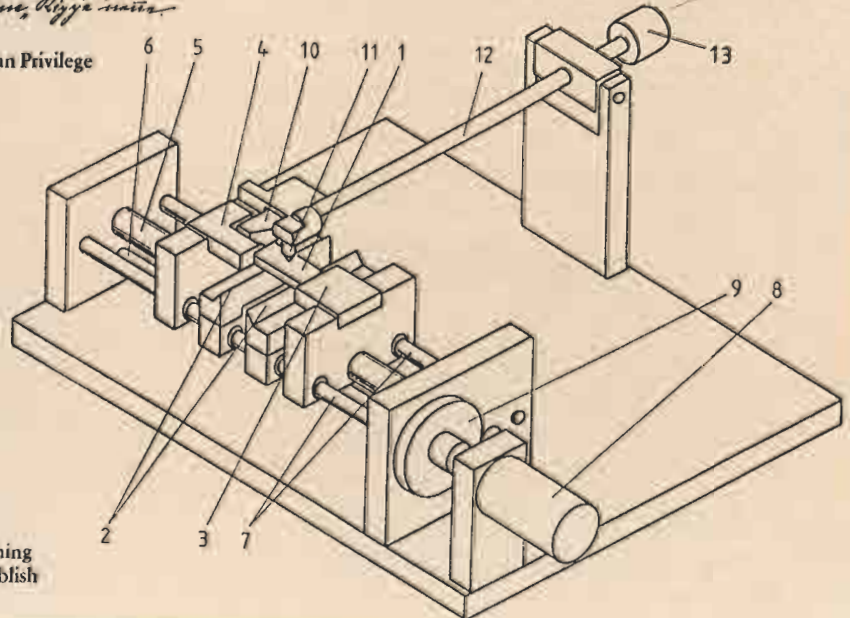


Fig. 3 (Above): First page and diagram from 1876 Austrian Privilege claiming the testing of size and mass of coins for the detection of fakes.

Fig. 4 (Right): Diagram from modern patent (1984) claiming resonance frequency testing of gold coins and bars to establish authentication.

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A.D. 1840 N° 8447.

Plating Metals.

G. R. AND H. ELKINGTON'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, GEORGE RICHARDS ELKINGTON and HENRY ELKINGTON, of Birmingham, in the County of Warwick, Gentlemen, send greeting.

WHEREAS Her present most Excellent Majesty Queen Victoria, by Her Letters Patent under the Great Seal of Great Britain, bearing date at Westminster, the Twenty-fifth day of March, in the third year of Her reign, did, for Herself, Her heirs and successors, give and grant unto us, the said George Richards Elkington and Henry Elkington, Her especial licence, full power, sole privilege and authority, that we, the said George Richards Elkington and Henry Elkington, our executors, administrators, or assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick-upon-Tweed, our Invention of "IMPROVEMENTS IN COATING, COVERING, OR PLATING CERTAIN METALS," in which said Letters Patent is contained a proviso that we, the said George Richards Elkington and Henry Elkington, or one of us, shall cause a particular description of the nature of our said Invention, and in what manner the same is to be performed, to be enrolled in Her said Majesty's

Fig. 5 The classic British Patent No. 8447 granted to the Elkington brothers in 1840 for their original gold electro-deposition process. Even though only the first 4 pages are reproduced here, a simple eloquence lost in modern publications is apparent throughout.

G. R. & H. Elkington's Impts. in Coating, Covering, or Plating certain Metals.

This takes place when the metal is brought to a state a little below red heat, and may be ascertained by observing when the surface of the metal assumes a whitish appearance. The article is then ready for the process of fusion, which we perform in the manner following.—Take a sufficient quantity of calcined borax and put it into a suitable vessel. The vessel which we use for this purpose is of cast iron made after the shape of a glass maker's pot and heated by a surrounding flux. In this vessel the borax is to be fused, the temperature being raised until the borax becomes quite fluid and of sufficient heat to melt silver, which may be ascertained by immersing therein a piece of metal coated with silver. The time required to effect perfect fusion of the silver will depend partly on the temperature of the molten borax and partly on the nature of the work to be done; if the articles are of thin wrought metal fusion will take place in from a few seconds to a minute. Care must, however, be taken where the heat is sufficient for that purpose, that the copper be not in part melted, as will sometimes happen if the article be suffered to remain too long in the flux. On the other hand, if the articles are massive, or some heavy cast goods, the time necessary to effect perfect fusion of the silver will be comparatively long, and in these cases care must be taken that every part of the surface is fused, attention being directed in particular to the thicker or more solid parts of the article, which, of course, will be longer in arriving at the necessary degree of heat, and will therefore be the last to fuse. This the workman will readily ascertain by lifting the work from time to time out of the borax, for if the silver be fused the borax will run off from the metal, and the surface will assume the lustre of melted silver, whereas if it be not perfectly fused the borax will adhere. In practice we have found it convenient, when the article to be coated is large, to attach it to an iron rod or strong wire, so as to enable the workman to move the article readily during the process of fusion, and this has the further advantage of causing the silver to flow more equably over the whole surface; but if the articles are small it will be found convenient to put a number of them together into a shallow basket made of strong iron wire or perforated sheet iron, or, which is still better, of platinum. This may be lifted in or out of the borax by means of a handle or rod attached, and when the work is perfectly fused it may be lifted out therefrom with a pair of light tongs or the like. When the fusion of the silver surface of the article is complete, we cool it either by immersion in cold water or gradually by exposure to the air, preferring, however, the former, and afterwards wash it in dilute sulphuric acid (composed of one part acid to twelve parts of water) until the adhering borax is all dissolved. This method of plating is of advantage

G. R. & H. Elkington's Impts. in Coating, Covering, or Plating certain Metals.

High Court of Chancery within six calendar months next and immediately after the date of the said in part recited Letters Patent, as in and by the same, reference being thereto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, we, the said George Richards Elkington and Henry Elkington, do hereby declare that the nature of our said Invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, that is to say:—

Our Invention consists of four parts, and has reference to several distinct operations, processes, or methods, videlicet:—

First, to a method of covering, coating, or plating copper and brass with silver, by first applying a coating of silver to the surface of the metal to be plated, and afterwards fusing the same thereon, so as to cause the silver to unite and alloy with the surface of the coated metal, in the manner hereafter described.

Secondly, to a method or methods of coating, covering, or plating certain metals with silver by the use of a solution of silver, and further by the use of a solution of silver in connection with the application of a galvanic current, as also herein-after described.

Thirdly, to a method or methods of coating, covering, or plating certain metals with gold by the use of a certain solution of gold, and further by the use of a solution of gold in connection with the application of a galvanic current, as also herein-after described.

Fourthly, to a method of preparing iron so as to render it better fitted for receiving a coating of copper or other metals.

The first branch of our Invention, videlicet, the method of coating metal with silver by fusing the coating surface, is thus performed.—The metals to be plated being first rendered perfectly clean (in the usual manner) are then set to silver. This may be done by any of the known modes of silvering in use for this purpose. But the method which we prefer and adopt is either that pointed out and described in the Specification of a Patent granted to Henry Elkington, on the fourth day of December, (the thirtieth of August last and thirty-seven, or that herein-after pointed out in this our Specification as the process of coating with silver without the use of the galvanic battery. Upon the surface thus silvered we apply a hot solution of nitrate of silver more or less concentrated according to the thickness of the coating of silver required, which we perform by immersing the metal to be coated in the solution. When this has been effected we submit the metal to a temperature sufficient to expel all the acid, and leave a merely metallic coating of silver.

G. R. & H. Elkington's Impts. in Coating, Covering, or Plating certain Metals.

where hardness is required, as the process of fusion alloys the silver with the surface of the copper, and renders it extremely hard. For a finish to improve the whiteness of the silver surface, the article may be annealed and boiled in dilute sulphuric acid or muriatic acid, as practised by silversmiths, but we prefer to apply a slight coating of pure silver by means of a galvanic current, as herein-after described in this our Specification. Of the metals to be thus coated we have found copper and its alloys with zinc, such as are known in commerce by the terms of gilding metal and good brass, to succeed best.

We claim therefore, in respect of this part of our Specification, the method of coating copper and its alloys with silver, by the process of fusing silver upon the surface of the coated metal in the manner above described, whereby the coating of silver is alloyed or united with the surface of the coated metal.

The second branch of our Invention, which consists in the coating, covering, or plating certain metals with silver by the use of a solution of silver simply, and also by the use of a solution of silver in connection with the application of a galvanic current, we perform as follows:—First, we dissolve oxide of silver in a solution of prussiate of potash (cyanide of potassium) in the following proportion or thereabouts, that is to say, to three pounds of prussiate of potash dissolved in two gallons of water, we add five ounces of silver in the state of oxide, and agitate or boil the same until dissolved. The prussiate of soda may be substituted for the prussiate of potash, but the latter is more convenient. The solution thus prepared is then ready for use. The articles to be coated being first rendered perfectly free from scale or grease, which we effect by the usual process of cleaning metals, are then immersed in the solution. Usually a slight covering of silver is required, as in ordinary silvering, we prefer to use the solution boiling, and such coating is usually obtained in from a few seconds to a minute. For this degree of coating the application of the galvanic battery is not required. But, secondly, if a thicker coating of silver be desired, as in plated wares, we prefer to use the same solution cold, and obtain a thicker deposit of silver by the application of a galvanic current. The methods of producing and applying galvanic currents are various. The most simple with which we are acquainted is contact with a bar of metallic zinc or other electro-positive metal. A membranous or porous diaphragm may also be used, in such a manner that the solution of silver shall occupy one side, and a dissimilar fluid the other; but we have found that the most efficient and convenient for the purpose above mentioned are some forms of those used for philosophical purposes, and known by the names of constant or sustaining batteries. That at which we prefer, and most frequently employ, consists of two concentric cylinders closed at the bottom, the outer one of

Electrodeposition of Gold

As some 60 per cent of the present day non-dental industrial usage of gold involves gold in the electrodeposited form, it is perhaps fitting that we should dwell briefly upon an historic British Patent, No. 8447 granted in 1840 to the brothers George and Henry Elkington which was not only the first unambiguous exposition of the aqueous electrolytic deposition of gold but also helped to lay the foundation for the modern electroplating industry. Little, one imagines, did the Elkingtons guess that their landmark patent, almost 150 years ago, would give birth to one of the most competitive and highly patented technological fields in modern times.

As with the Austrian privileges discussed earlier the Elkington gold plating patent reveals an eloquence seldom seen in its modern counterparts (Figure 5).

Modern Patents as an Information Source

The European patent application referred to above takes us right into the modern patent scene and there we find that the patent information available falls far short of being fully used. This is due to a number of misconceptions touched upon earlier, and also to the fact that patents frequently are written in a legal jargon referred to as 'patentes'. A further factor is that to R & D personnel they are often not as readily available as is the journal literature. However, many developments of technical importance are published as patent documents, and only a surprisingly small fraction of these appear later in scientific and technical journals (3). A look at Japan with its impressive technological revolution which took place over the past several decades, and which, as it developed was considered to be due largely to copying, shows how this country made and continues to make extensive use of patent information, and does not attempt to deny this. This is evident from the words by Dr. Masaru Ibuka, 9th President of the Japan Institute of Invention and Innovation (JIII) who said:

'Japan's economy developed remarkably after World War II, very much as a result of progress in science and technology. However, this progress, as is commonly known, depended upon research and development based on technology transfer from the advanced countries of Europe and America. It was not the outcome of Japan's original research and development. Today, Japan ranks with the other advanced countries in science and technology'.

Nowadays, Japan is the most prolific single contributor to the patent literature, a phenomenon for which the name 'Japanese Penetration' has been coined. Besides this, and apart from the language problem, the Japanese patent system presents its own difficulties to the rest of the world, which will become apparent below.

If we consider inventions relating to gold usage, Tables I and II give interesting figures of published patent documents over the period 1980-1984 under the IPC (International Patent Classification) Subgroups C22C 5/02 (alloys based on gold) and C25D 3/48 and 3/62, (electroplating of gold and gold alloys) (5).

In terms of the number of patents published, Japan today is the

Table I
Published Patent Applications for the IPC Subgroup C22C 5/02 (Alloys Based on Gold)

Year	1980	1981	1982	1983	1984 up to Sept.	1980-1984 Total
World excluding Japan	16	10	2	14	7	49
Japan	27	18	11	20	56	132
Total	43	28	13	34	63	181
Japanese penetration %	63	64	85	59	89	73

Table II
Published Patent Applications for the IPC Subgroups C25D 3/48 (Electroplating of Gold) and C25D 3/62 (Electroplating of Alloys Containing More Than 50% by Weight of Gold)

Year	1980	1981	1982	1983	1984 up to Sept.	1980-1984 Total
World excluding Japan	36	25	19	20	17	117
Japan	13	17	26	14	7	77
Total	49	42	45	34	24	194
Japanese penetration %	27	40	58	41	29	40

most active contributor to the world patent literature. However, the significant Japanese penetration, which is evident from Tables I and II needs some qualification. For instance, the 56 Japanese publications describing new gold-based alloys against 7 from the rest of the world during the first 9 months of 1984 contain a large number of variations on one theme. Thus the Japanese Unexamined Applications

JP 59-100237 JP 59-107045
 JP 59-100238 JP 59-107046
 JP 59-100239 JP 59-110743
 JP 59-100240 JP 59-110744
 JP 59-100241 JP 59-110745
 JP 59-100242 JP 59-110746
 JP 59-100243 JP 59-110747
 JP 59-100244 JP 59-110748
 JP 59-107042 JP 59-110749
 JP 59-107043 JP 59-110750

JP 59-107044

were all filed by Tanaka Kikinzoku Kogyo Limited. These applications have almost identical texts and all deal with materials for electrical sliding contacts, in which to a number of basic gold alloys are added varying amounts of other elements. This practice of filing separate patent applications obviously inflates considerably the number of published documents and therefore statistics such as those given in Tables I and II which indicate an impressive domination by Japanese documents should be read with appropriate care. Incidentally, the prefix 59 in the above patent numbers is the Showa number, indicating the year of the present emperor's reign. (Showa numbers are converted into Gregorian years by adding 1925, i.e. 59 + 1925 = 1984).

The Japanese 'one claim one patent' principle is also the reason why in patents or patent applications filed by Japanese applicants in other countries multiple priorities are frequently encountered: in these cases a number of separate Japanese documents have been condensed into one application conforming to European or American standards.

Tables I and II also show that the actual number of annually disclosed inventions describing gold-based alloys, and new processes and techniques for electroplating gold are quite manageable. The number of actually published documents is, of course, considerably higher, due to equivalent patents being filed in various countries. Nevertheless, such 'Patent Families' substantially increase the information value of the patent literature because frequently applications filed in different countries offer one document translated into various languages (sometimes with minor differences due to differing national patent laws).

Sources for Patent Information

There are definite signs that patent awareness is on the increase. We need only look through the reference lists of many recent papers to confirm this. For example, in the review paper on electroless gold plating by H.O. Ali and I.R.A. Christie published in a recent issue (October 1984) of *Gold Bulletin*, not less than 20 out of 60 references, or 33 per cent, are patent publications. This increase is due to the fact that today patent information is more readily obtainable than hitherto as a result of the development of patent information services, the efficiency and sophistication of which were well demonstrated at the recent WIPO (World Intellectual Property Organisation) First Patent Information Fair (4). Services such as the International Patent Documentation Center, (INPADOC), Derwent, Chemical Abstracts, Pergamon Infoline, Mead Data Central and CLAIMS not only allow the identification of patent publications in certain fields *via* a computer terminal, but certain data banks can be searched for patent families and even the legal status of patents. Knowledge of the latter can be of the utmost importance and benefit as is illustrated by the following.

Patents can be valid for periods of up to 20 years. However in many countries annual renewal of them is required. Because of this and the costs involved, many patents expire long before their

possible lifetime. Thus the average legal validity of patents in the Federal Republic of Germany, for instance, is estimated to be only about 3 years! The information contained in patents which have expired can be freely used anywhere.

Apart from the patent information services mentioned above, there are published comprehensive reviews of the patent literature in specific fields. Examples which can be mentioned are the 'Chemical Technology Reviews' by Noyes Data Corporation (6) and the 'European Patent Office Applied Technology Series' (7). The current patent literature relating to gold usage in science and technology is covered in 'Gold Patent Digest', published quarterly by the International Gold Corporation.

With the availability of these and other services for patent information, and copies of the original documents being readily available from patent offices and patent services, the patent literature including that describing new gold technology and uses should gradually assume its proper place as a source of technical and scientific information.

References

- 1 *New Scientist*, 1984, 103, (1419), 25
- 2 P. Ritter von Beck; *Das Österr. Patentrecht* Carl Heymanns Verlag, 1983, p. 120
- 3 F. Liebesny *et al.*, *Inf. Sci.*, 1974, (Dec.), 165-177
- 4 1st WIPO Patent Information Fair, Geneva, September 26 and 27, 1984
- 5 Data extracted from material supplied by INPADOC
- 6 'European Patent Office Applied Technology Series', Vols. 1-8, Pergamon Int. Inf. Corp., VA., U.S.A., 1984
- 7 'Chemical Technology Reviews', Many volumes, Noyes Data Corporation, NJ., U.S.A.