adoption of an international screw thread system must ultimately come, because international uniformity is necessary, and not because any particular system of weights and measures is used. And it will not come by Act of Parliament, but by concerted action in international technical congresses, which will also effect the standardization of many other things of importance in mechanical work. The adoption of the metric system need no more affect the present trade sizes than it would affect the size of a shop in which the articles are manufactured. The alteration of the system of longitude did not affect the position of the cities upon the earth's surface, although it did require the restatement of their position, but the advantages of a single universal standard of longitude and time were found to easily compensate for the temporary inconvenience of the transition period.

In a footnote to Mr. Halsey's article the incorrect statement is made that "the (metric) system is not required in governmental or any other transactions" (in the United States). Numerous governmental actions show that Mr. Halsey was uninformed on this point.

First. The foreign postage rates of the United States are fixed in terms of the metric system, fifteen grams being sent to all countries in the postal union for five cents.

Second. The subsidiary silver coinage is made in accordance with the units of the metric system. (Revised Statutes, Sec. 3513.)

Third. The metric system is obligatory in all transactions, sales and contracts in Porto Rico. (Action of March 18, 1899, containing the statement "that wholesale and retail mercantile establishments shall sell their goods to the public conformable to the metric system.")

Fourth. The metric system is required in the Philippine Islands. (Act September 17, 1901, Sec. 9, Philippine Tariff.)

Fifth. In the United States army since January 1, 1895, the use of the metric system has been required in all work of the medical and surgical department.

Since April 27, 1878, the officers of the Marine Hospital Service for all official, medical and pharmacal purposes have been required to "use the metric system of weights and measures."

Regarding the opposition to the metric system, it is of the usual kind which obstructs any forward movement. The plea of *laissez faire* is easily raised, and proves nothing but the apathy of human nature. The organizations mentioned as opposing the system are more than balanced by the overwhelming sentiment in favor of the change which prevails among those who have actually studied the matter or come into active touch with the system.. But as a matter of fact the adverse actions which Mr. Halsey enumerates were taken without proper consideration of the merits of the system and a misconstruction of the purport of the bill favorably reported by the Congressional Committee. Manufacturers have been made to believe that they would be compelled to change their patterns, drawings and machines, and that the change would come upon them all at once. The truth of the matter is that no manufacturer can be compelled to do these things, nor does the Act now before Congress contemplate anything of the kind. Every manufacturer can continue along his present practice until he desires to make a change. When he makes new patterns and drawings he will naturally make them in the metric system, and without extra cost.

It is interesting to note that the American Machinist, a representative paper of the machine trade in the United States, has limited its columns to expression of opinion from those only who have had actual experience in the use of both systems, and the consensus of these opinions as expressed within the past year is nearly unanimous in favor of the metric system. This expression of opinion of those who are best in position to know should outweigh the conservatism of those who are unfamiliar with the system in their actual experience. The active opponents of the metric system in the United States are few. They appear not to see that we are really in the transition period which they had viewed with apprehension. It is not a question of introducing the metric system, which is already here, but whether we shall continue to maintain side by side two systems: one a cumbersome work of mediæval times; the other, an international system of maximum simplicity and efficiency.

Respectfully,

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THE STEEL HARDENING METALS.*

There are included, under the head of steel-hardening metals, nickel and cobalt, chromium, tungsten, molybdenum, vanadium, titanium, and uranium, which are named in the order of the importance of their production and use for steel-hardening purposes. These metals are not added to the steel to cause chemical reactions to take place, by which harmful ingredients are made to go into the slag or to pass off as gases, as is the case in the use of ferrosilicon or ferromanganese (spiegeleisen), which are added to the furnace in the original manufacture of the steel. These other ferro alloys are not added until after the steel has been manufactured, and their use is as a physical addition to the manufactured steel for the physical benefits that they confer upon it, and hence they accomplish their purpose in a manner entirely different from that of the ferrosilicon or ferromanganese.

Some of the metals, as nickel, chromium, and tungsten, are now entirely beyond the experimental stage and are well established in the commercial world as definite steel-hardening metals, and new uses are being constantly devised for the different steels, which are causing a constant increase in their production. Others, as molybdenum and vanadium, although they have been proved to give certain positive values to steel, have not been utilized to any large extent as yet in the manufacture of molybdenum or vanadium steel, partly on account of the cost of the ores containing these metals. Titanium and uranium are still in the experimental stage; and, although a good deal has been written as to the value of titanium as an alloy with steel, there is at the present time very little if any of it used in the manufacture of a commercial steel.

Since the introduction of the electric furnace and the consequent methods that have been devised for reducing ores, it has become possible to obtain these ferro alloys directly from the ores by reducing them in the electric furnace, and hence experiments have been conducted on a much larger scale than formerly.

The prices of the various ferro alloys vary considerably. Ferrochrome in December, 1903, was quoted at $120 to $225 per ton of 2,240 pounds; cost, insurance and freight, New York, on the basis of 60 per cent., with variations up and down at $1.75 per unit. Ferrotungsten was quoted at 40 cents per pound, or $896 per ton, on 100 per cent., cost, insurance and freight, New York. Ferrovanadium was quoted at $7.50 per to $2.50 per pound, or $3,360 to $5,600 per ton, on 100 per cent., cost, insurance and freight, New York; in May, 1904, this had dropped to $1.25 per pound on 100 per cent., cost, insurance and freight, New York. Ferrovanadium was quoted at $7.50 per pound, or $16,800 per ton, on 100 per cent., in the English market, and $6.40 per pound in the French market; for ton lots the price has been quoted as low as $4.50 per pound. Ferromanganese has, during the last two or three years, been very steady, and on contract, 100-ton lots and over, was quoted at $50 per ton, duty paid, with freight paid east of the Mississippi River. In May, 1904, this price had dropped to $44 per ton. Ferro-nickel alloy and metallic nickel vary from 50 to 56 cents per pound for the nickel content.

Besides the use of ferromanganese for the chemical effect which it produces in the manufacture of steel in eliminating injurious substances, it is also used in the production of a special steel which possesses to a considerable degree combined hardness and toughness. Such steel contains from 0.8 to 1¼ per cent. of carbon and about 12 per cent. of manganese, and is known as "Hadfield manganese steel." If only 1.5 per cent. of

*The Bulletin of the American Iron and Steel Association, December 10th, 1904.