

Metallizing

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USES FOR MACHINE ELEMENT WORK

The largest single use for metallizing today is for machine element work. This includes maintenance and repair and also includes salvage of mis-machined parts. The metal to be sprayed in each case is selected for the physical properties of the spraymetal which will be produced. Because of the excellent wearing qualities of the spraymetal, it is used most extensively on bearing surfaces. The machine element is first prepared, usually by some form of roughening, and then sprayed to a larger size than the finished size. Spraymetal may then be machined or ground.

Typical uses of metallizing for this type of work are illustrated in Figs. 7 to 10. In Fig. 7 is shown the salvaging of a 60,000-pound chill mold with 50 pounds of spraymetal. In Fig. 8 a steam cylinder is being metallized with iron to restore the bore to its original size. In Fig. 9 an armature bearing is being prepared for metallizing. After this preparation, spraymetal will be applied, and then finished to size. Many scrap piles are being redeemed in this manner. Fig. 10 shows how metallizing is being used to make repairs on the job without complete dismantling. The steam turbine shaft is being built up to size at the packing area where it was badly pitted. A portable grinder was installed on a bracket for the final finishing of the journal.

USE FOR NEW PRODUCTS

Spraymetal as a new material offers many new possibilities because of its various and unusual properties. It will be used much more extensively in the future for corrosion resistance on newly manufactured articles. Its recent rapid expansion in the field of tumbling barrel coating of small articles indicates this trend. Its use for inlay of such metals as stainless steel on shaft sections has increased rapidly in recent years. It is being used, for instance, on turbine shafts in several standard makes of steam turbines at the packing ring section.

Metallizing will be used very extensively in the future on newly manufactured articles for bearing surfaces, such as crank shafts, because of its superior wear qualities and oil retention feature. Metallizing is being used extensively for the manufacture of carbon brushes and resistors to provide a means of soldering to the carbon. It is being used for the manufacture of electrolytic condensers, the condenser plate being manufactured from cloth tape on automatic metallizing machines. Glass is metallized with copper in production to permit soldering to the glass for sealing purposes, as on gas meter windows. Glass reflectors are being manufactured with reflecting surfaces of sprayed aluminum.

FUTURE OF METALLIZING

The future of the metallizing process lies in two obvious directions. One is the further technical development of the process itself, and the other is the expansion in uses of the process. It is only natural that today the development of the process is ahead of the uses. This is always the case with a relatively new development. Specific applications have brought about the development of metallizing equipment and processes, and this same equipment with the same processes is suitable and available for many other uses that have yet to be found.

It is probably safe to predict, therefore, that the most immediate postwar trend will be the vast expansion of the uses of the present process, while the technical development continues for use in future years.

The biggest increase in use probably will be for bearing surfaces. Another big expansion in use will be for corrosion resistance, particularly on small products produced by production methods, as by tumbling barrel spraying. Metallizing structures such as metal window sash and metal furniture, as an undercoat for paint, will, no doubt, increase very rapidly. The biggest future uses, however, are doubtless among those that have yet to be discovered. New applications are increasing rapidly as the engineering profession appreciates more and more that spraymetal is truly a material with a future.

STATESMANSHIP

By ROBERT A. MILLIKAN*

A YEAR ago a group of some 400 men, quite similar to this group, had completed training in meteorology in U.C.L.A. and C.I.T., just as you now have done, and were then assembled to receive their commissions in the Air Corps.

At that time I chose to address them not in their capacity as soldiers, but rather as citizens of the United States. I shall do the same again to you today, for while we hope that it will be only for a very short time that you will be doing your duty as officers in the United States Army, for the next half century you will be playing a vital role, I hope, in what I expect to be the most critical peacetime period in the history of the world—a period in which we Americans have it in our power largely to determine whether mankind can find a substitute for war and therefore can usher in for the world a period of lasting peace.

That issue will depend, first, upon our will to peace, and, second, upon the kind of statesmanship developed in the United States. That statesmanship will be but a composite of the statesmanship of you voting citizens of this country. You men who are before me today can be vital factors in the determination of the quality of that

statesmanship. Your service along side British and other Allied troops will open your own eyes to international situations and to the stupendous need now and in the future of international cooperation, and in particular Anglo-American cooperation.

Let me first try to give you as clear and full an idea as I can of what I mean by statesmanship. Walter Lippmann is generally considered America's foremost political analyst and commentator. According to a recent, and I think a dependable, poll his syndicated column extends its educating influence at its every appearance over some three million American citizens.

One of his recent most penetrating observations was to the effect that the real progressives, the constructive men who alone deserve to be called forward-looking liberals, are in general not found either on the extreme left, which presumes to call itself liberal, or the extreme right, though even Hitler calls himself a democrat, Nazi meaning "National Socialist." Progress actually finds its source and gains its strength in the main not from the left or the right, but from the center.

This is no new discovery. The Greek philosophers knew it when they coined the phrase "the golden mean." The wise men of Rome expressed their approval in the slogan "*Ne Nimum*."

The reason why neither radicals nor reactionaries—extremists on either the left wing or the right—in general are not effective progressive leaders is quite clear. It is because these two groups are very much alike in the

*Address June 5, 1944, at the exercises commissioning Aviation Cadets in Meteorology from the Army Air Forces Base Units at the California Institute of Technology and the University of California at Los Angeles.

characteristic that destroys their effectiveness, namely, they are both in the main emotionalists rather than careful analysts. They are men who are guided primarily by their feelings and their preconceptions rather than by well considered intelligent judgments.

On the other hand, the man who is an effective leader in human progress, the man who possesses that great and rare quality which we call statesmanship, is of necessity a rationalist—a man capable of analyzing and appraising the whole situation, seeing what it is possible to *do* under existing circumstances, and with the use of actually existing forces. Of course he ought to have, and in general he does have, far-reaching ideals, but he must also have sufficient analytical power and sufficient wisdom not to destroy his own influence by butting his head against a wall for an unattainable ideal. He must have sufficient wisdom to avoid setting back all reform through creating so many antagonisms as to produce disorder instead of ordered progress. He must be able to see the merits of both sides of a controversy. He must be able to negotiate, to persuade, to find a solution that promotes the real, long-range interests of all parties. He must educate his public to an understanding of its long-range interests, and to a willingness to set its sights, not upon its immediate interests, but upon the long-range goals.

After this war the American people as a whole will confront the necessity of developing vastly more of that sort of statesmanship than we have developed in the past or have been under the necessity of developing. In our isolated position it is not surprising that our record has been in no way comparable in the matter of statesmanship with that of the British. Britain's Statute of Westminster of 1931, for example, is nothing less than a milestone in human history. The American Revolution is called such a milestone because it created for the first time free, representative government outside of England, where it had been developing for the preceding five centuries. But the Statute of Westminster was a greater milestone in the progress of mankind toward a rational, beneficent world order, for it was what created "The British Commonwealth of Nations" as it is today, unquestionably the nearest approach to an actually working world organization of free peoples that has yet been achieved.

Through the voluntary extension of complete local self-government to all the constituent members of the Commonwealth (and India, too, was years ago offered dominion status, like all the rest, as soon as she would organize herself to use it) the British have exhibited a profound statesmanship altogether unique in history. The Statute of Westminster is the first example of the relinquishment of centralized power in place of its seizure. It is a greater step than the American Revolution because it represents the discovery of the mechanism of social revolution without a cannon shot, the inception of reasoned progress without the spilling of a single drop of blood.

Within the British Commonwealth is found the cleanest civil service, the greatest freedom from political corruption (this is the great historic destroyer of democracies, and the chief menace to the future of our country) that exists or ever has existed anywhere on earth. That clean political civil service, that freedom from political corruption, the key to which is local self-government such as the constituent members of the British Commonwealth possess, is the *sine qua non* for the preservation of a free representative society such as we often speak of incorrectly as democracy, for no pure democracy ever succeeded anywhere on earth. So-called democracies, better called republics, have always been destroyed either by internal corruption or by external aggression. To prevent the latter some kind of federation or union of peace-loving communities or states for their common de-

fense against bandit nations bent on world conquest is an obvious necessity, and of this the British Commonwealth of Nations has been thus far the best example, combining the maximum freedom of the parts with adequate ties for defense against external aggression. In the century from 1814 to 1914 it was the British fleet in the main that not only protected the parts of the entire empire, but also served as world policeman and protected small independent countries like Holland, Belgium, and many others. Indeed, it is probable that without the protection of that fleet, free representative governments, including our own, could not have developed all over the world as they did.

But after this war, in view of our resources and our power, we in the United States must of necessity become as internationally minded as the British and we must clearly do our share of world policing. I also hope that all peacefully disposed nations will contribute to that policing job in proportion to their strength. But it cannot possibly work unless the three great powers that have now the policing strength can somehow learn to cooperate with one another. Never has there been a world situation in which it was so clearly to the long-range interests of all of these three powers to create a machinery for insuring between them a period of lasting peace.

Let no man be misled by the shallow talk so much in vogue just now that a nation seeks and should seek only its own interests. If the makers of that statement mean to assert that a nation can only consider its immediate interests it is a stupendous falsehood which if believed in and followed will inevitably bring ruin to any people that practices it. For ignoring the interests of all other nations inevitably arouses not only the hate of all mankind but it forces the whole world to combine and attack any nation that follows that practice just as it is now attacking Hitler, and no nation on earth is strong enough alone to withstand such attack.

A nation that is possessed of any wisdom and any statesmanship at all will and should seek its long-range interests it is true, but it will also know that the greatest interest and the greatest asset any nation can have is the good will, the confidence, the respect, and the friendship of other nations. Any trade or any international conduct that does not in the long run and on the average profit all the parties involved is simply international banditry and that is precisely what we are fighting this war to put an end to. In other words, we American citizens as a whole have got to learn the statesmanship of international cooperation if we want to live during the next 50 years in a decent world.

Let me repeat, I hope that all nations can contribute in proportion to their strength to put down international banditry, but fortunately it is at this moment both to the immediate and also to the long-range interest of the three strongest nations, Britain, Russia, and the United States, to exert their joint power to destroy that Nazi, that wild-beast type of ideology, and inaugurate a period of lasting peace. Because of this conjunction of interests there never has been in history a moment so favorable for this effort. Britain's present situation and the last 100 years of British history constitute the assurance that she will do her part. Will Russia and the United States do theirs? If either one of us refuses and threatens to start out alone on a program of world conquest the other two, with the assistance of the smaller Allies, must be powerful enough to make the project hopeless.

Is, then, such international cooperation in the interests of a lasting peace a possibility? I answer, if Britain and the United States with their history and their relationships cannot learn to cooperate, then certainly nobody can, and the project is a hopeless one. Therefore, the

future of the world today reduces to just one thing, namely, the possibility of Anglo-American cooperation. The alternative is ever recurring world wars, and the end certainly of Western European and American civilization. I think the answer is in the hands of the citizens of the United States whom you young men will be in position to do much to educate and to lead.

JUNE COMMENCEMENTS

ALTHOUGH the next regular Commencement will be held at the end of October, June brought two special Commencements for graduates of courses arranged primarily to meet war needs and schedules out of phase with the normal academic calendar. The first of these Commencements was held Saturday, June 3, at 10 A.M. in Tournament Park. That day's group of graduates had completed the three-term course in meteorology which was set up several years ago primarily to supply trained meteorologists for the Army. (For the last two or three rounds of the course Navy personnel has also been enrolled in it, and a few civilians). The June 3 graduates comprised officers of the U. S. Naval Reserve, aviation cadets of the U. S. Army Air Forces, and civilians, including several students from Latin American countries who had attended the Institute on U. S. Weather Bureau fellowships. The Certificate in Meteorology was awarded to 11 Navy officers, 131 cadets, and three civilians. The degree of Master of Science was conferred upon 35 Navy officers, nine cadets and one civilian (and, *in absentia*, on five Army officers).

Rabbi Edgar F. Magnin, whose son, Cadet Henry D. Magnin, was one of the graduates, served as Commencement chaplain. The Commencement address was delivered by Dr. Max Mason, member of the Institute's Executive Council; Dr. Robert A. Millikan awarded certificates and degrees; and brief addresses were made to the graduates on behalf of the Navy and Army by Rear Admiral Ralston S. Holmes, U.S.N. (Ret.), Navy Department Liaison Officer, N.D.R.C., and Major Philip E. Daugherty, A.U.S., Judge Advocate, Headquarters, Los Angeles Civilian Schools Area, Army Air Forces Western Technical Training Command.

On the following Monday afternoon, June 5, commissioning exercises were held in Tournament Park for the Institute group of cadets and a group from the University of California who had just completed a similar course in meteorology. Major General John F. Curry, Commanding General, Western Technical Training Command, flew west from his headquarters in Denver to take part in the ceremonies. In a colorful ceremony the 260 cadets were reviewed by General Curry and a group of guests consisting of high-ranking Army and Navy officers and representatives of the Institute and U.C.L.A., who reviewed the meteorology training program, and Lieutenant Colonel Oscar Heinlein, who spoke on behalf of the Weather Wing, to which the cadets are assigned after commissioning. Lieutenant Colonel Franklin Rose, commanding officer of both the Institute and U.C.L.A. units, presented awards to outstanding students. After the commissioning oath was administered, General Curry presented the cadets with their commissions as second lieutenants in the Army of the United States. The program closed with the presentation of Awards of Merit to the Institute and U.C.L.A. for their part in the meteorology training program, and to Pomona College for its conduct of a pre-meteorology course.

These exercises marked the termination of the Army's meteorology training. The meteorology course will continue to be given at the Institute, but after July 1 it will

be scheduled on a semester basis and while it will be open to civilians, the students will be principally Navy men who are enlisted in the V-12 College Training Program.

The second June Commencement was held on the morning of the 30th in the Lounge of Dabney Hall. The principal group of graduates were the Army and Navy officers who entered the Institute November 1, 1943, to take the regular two-semester graduate course in aeronautics. Some received the degree of Master of Science in Aeronautics; others, who had completed at least a year of graduate work before being assigned to the Institute, received the professional degree of Aeronautical Engineer. Another group of graduates, composed of members of the Senior class who normally would graduate in October, were granted their degrees at this time because of imminent induction into the armed forces. Dr. Robert A. Millikan delivered the Commencement address on June 30.

COMMISSION WON BY HANCHETT

HOLLIS K. Hanchett, '43, was graduated as a second lieutenant recently from the Army Air Forces Training Command School at Yale University. During the graduation ceremony his mother, a second lieutenant in the Wacs, had the distinction of pinning the bars on her son.

Lieutenant Hollis Hanchett is now stationed at Boeing Aircraft School for B-29 Engineers at Seattle, Washing-



ton, and his mother is stationed at Fort Douglas, Utah, where she is performing administrative duties in the Tank and Automotive Section of the Ordnance Division.

Wac Lieutenant Ilda L. Hanchett won the National Women's Archery championship in 1932, and Lieutenant Hollis Hanchett won the junior archery title three years later. About a year ago mother and son gave up one of the world's most ancient weapons in favor of more effective firing equipment aimed at Axis targets.