

THE WASHINGTON GUN FACTORY.

In 1866, the Washington navy yard was fixed upon as the site of a naval gun factory, for the finishing of guns from forgings furnished by outside American steel manufactories, a similar gun factory for the army being established at West Troy, N. Y. At that time there were not in the country any steel manufacturers having the plant necessary to make these great forgings, but, under the encouragement guaranteed by the government, private enterprise was stimulated, and within the following two years both the army and navy departments were able to make satisfactory contracts with American producers, for the heaviest forgings, of a quality which would stand the severest tests. It is conceded that the plant now established at Bethlehem, Pa., is equal if not superior to any in the world for the production of armor and high-powered gun forgings.

The Washington gun factory was promptly proceeded with, and has already turned out a large num-

The rifling is effected in a machine carrying a bar whose cutting head operates during withdrawal, various devices being employed for regulating the twist or inclination of the grooves. The rifling is right-handed and the grooves are wider at the origin than at the muzzle. The breech is closed by the interrupted screw system. The factory is now well provided with the necessary boring and turning lathes, planers, slotters, shapers, and milling machines, drills, rifling machines, etc., which must each do their share in the work required upon the modern gun.

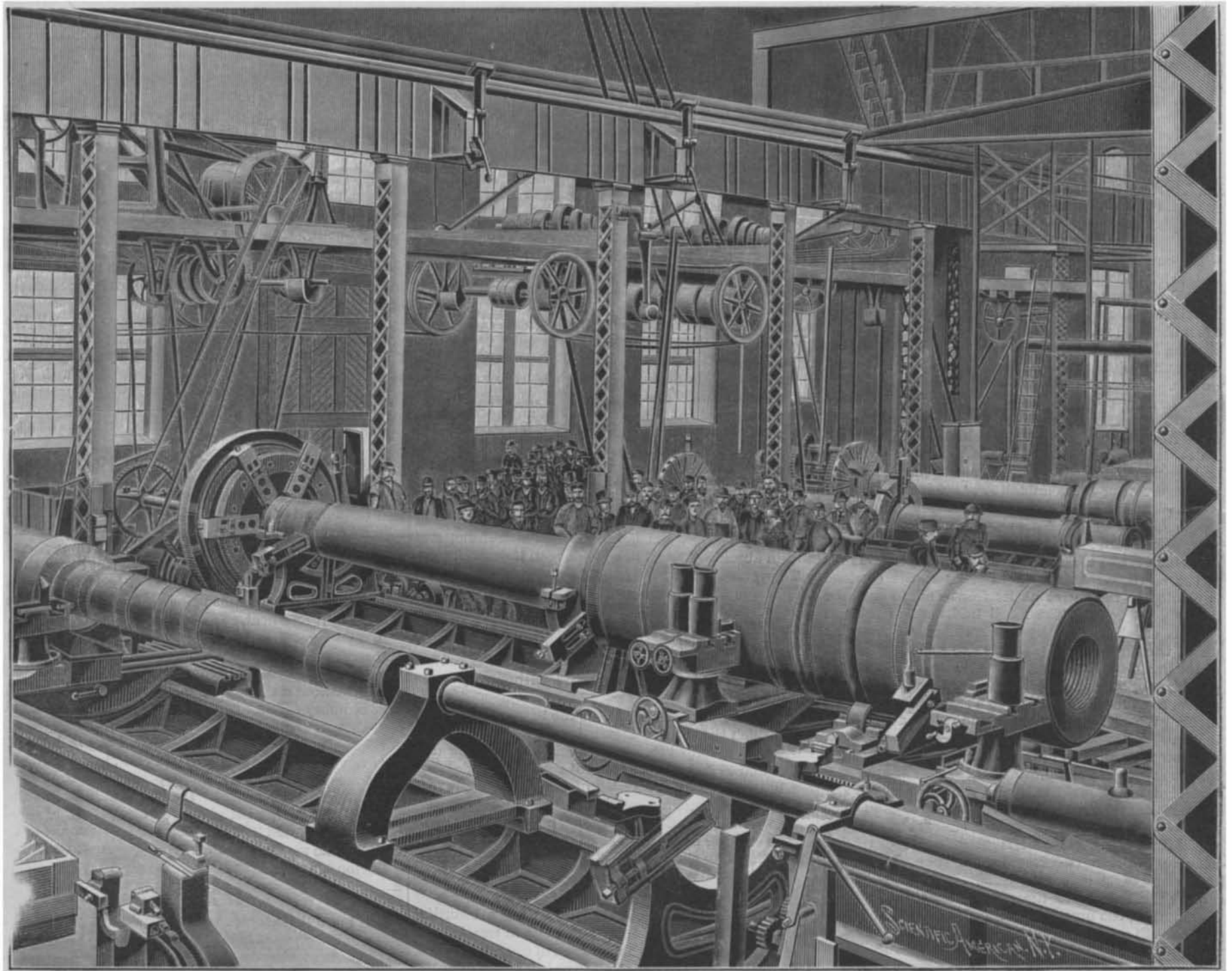
Nickel Coating on Platinum or Silver.

The following (says *La Metallurgie*) is the method of nickel-coating platinum, silver, or alloys of these metals adopted by the Societe de Laminage du Nickel, France. The metals to be united to each other should be in the form of plates or wires, the surfaces of which must be as clean as possible. The nickel should, moreover, be in such a condition of malleability that the

used in pharmacy, chemical laboratories, and certain industries, owing to their perfect resistance to the action of acids and alkalies.

Discovery of Planets by Means of Photography.

Dr. Wolf, of Heidelberg, has discovered two minor planets by means of photographic plates taken on December 22 and 23. One of these is new (No. 323), but the other is probably identical with Sapia (No. 275), which has only once been observed, in opposition. Since Dr. Wolf's discovery the two planets have been watched by Dr. Palisa at Vienna. The art of stellar photography has made rapid strides of late years, and has now become a powerful instrument in astronomical research. It has been expected that new planets would be discovered by this means, since, if two photographs of the same region of the heavens be taken at different times, upon comparison, a planetary body will betray itself by its movement with regard to the fixed stars in the interval, or, if a single plate be ex-



BORING, TURNING, AND CHAMBERING HEAVY GUNS AT THE WASHINGTON GUN FACTORY.

ber of six inch rifled guns, with a smaller number of eight and ten inches caliber, and the work for nearly a year past has also embraced those of twelve inches caliber. Work is also proceeding upon lathes for the production of 13, 14, and 16 inch guns. Our view gives a good idea of the appearance of the lathe room, to which the forgings are first sent, after the most careful inspection, rigid tests being made of several pieces cut from each forging. The lathes are served by a 110 ton overhead traveling crane, composed of a bridge which travels lengthwise the shop, a trolley traversing the bridge and fitted with gearing that hoists and lowers the weight to be moved. The power is transmitted through square shafting, the motions being controlled by clutches. On their arrival, the cars containing the forgings are run under the overhead cranes, the forgings being thus taken directly to their respective lathes for boring and turning, two operations which are frequently performed at the same time, the cutting tools shaving off the outside of the tube while the "hog bit" is taking the first and second boring cuts. The final boring cut is taken with a packed bit, this work and that of rifling being intrusted to very skillful mechanics only, as any error here would cause the ruin of the piece.

hammering or rolling which completes the welding should perfect the intimate conjunction of the metals. The surfaces to be united are powdered by a welding material, such as borax, and the two pieces are afterward subjected to a suitable welding temperature; they are finally united by hammering or rolling. In order to insure a successful conjunction, the surfaces to be welded should be prevented from coming in contact with the air, which would oxidize the nickel in its red hot state. For this purpose, a method (one of several) may be employed which consists in enveloping at the outset the metals to be joined by thin metallic sheets. When, after suitable heating and hammering, the metals are welded, the protective sheet can be removed by pickling, scouring, or other method. With the view of preventing the soldering of the protective sheet on the metals to be welded, it has been found advantageous to coat the interior surface of the protective sheet with a deposit of magnesia, lime, oxide of zinc, or other substance having the same properties, in order to obviate interior contact of the protective sheet with the metals to be welded. When the welding is finished, the protective sheet can easily be removed. Plates and wire obtained in this manner are adapted for the manufacture of receivers and utensils

posed long enough, the planet will, by its movement, trace a "trail" upon the plate, whereas the images of the stars will be dots, the telescope being driven by clockwork so as to keep them always in its field as they apparently revolve around the earth in consequence of the diurnal motion. The mean places for 1891 of the two planets found by Dr. Wolf are (1) 6 h. 38 m. 42.28 s. + 24° 47' 0.3", and (2) 6 h. 49 m. 30.64 s. + 18° 37' 5.33".

The preliminary survey of the Hawaiian cable has been nearly completed. The Albatross has laid out a line from Salinas Bay across the Pacific, and after taking a supply of coal made a return trip, the progress of which was interfered with by rough weather and interrupted by a lack of fuel. The vessel put in at San Francisco, and on January 6 proceeded to sea again to complete the survey of 600 miles. The line laid down by the Albatross on its outward trip is slightly north of that laid down by the Tuscarora fifteen years ago. Several submarine peaks were encountered, but the bottom is for the most part regular and suitable for the bed of a cable. The report of the return surveys of the Albatross has not been received at the Navy Department, and as soon as the information is in hand, the results will be plotted.