The Neophot, a New Microscope for the Examination of Metals and other Opaque Objects.

INCREASING demands for highest quality of raw materials and finished goods have led to extremely stringent and exacting examinations in all branches of industry. This entails the need for most efficient testing instruments.

The Zeiss Works, world-renowned makers of optical instruments, have paid special attention to this need and as a result, have devised an apparatus for microscopical and macroscopical examinations of materials, which satisfies every requirement with regard to performance, versatility and adaptability for different purposes, taking into consideration the necessity for a simple and compact construction so as to give that degree of convenience of operation which is imperative in comprehensive research work.

The NEOPHOT offers the possibility of microscopy and photo-micrography in bright and dark fields as well as in polarised light. The later mode of illumination, in particular, opens to Metallurgists and Research Workers an entirely new sphere. In addition, accessories are available for general survey photography of plane and non-plane objects with vertical and oblique illumination and for macro-photography of large objects in actual size or at small magnifications or reductions. The change from one operation to another can, in all cases, be quickly and conveniently effected, thus allowing the operator to avail himself of the numerous purposes of the instrument without waste of time.

A part of the general arrangement of the apparatus is shown in Fig. 1. The Microscope Stand with new combined illuminator for microscopy in bright field, dark field and polarised light, is to be seen from Fig. 2. The Microscope is designed along the lines of the inverted microscope, a successful arrangement ensuring rapid and effortless examinations of sections of opaque objects besides affording independence from the shape and size of the specimen.

The Arc Lamp H provided in the NEOPHOT offers all the advantages of a powerful source of light for photography and observation in dark field and polarised light while the large camera permits the adaptation of the bellows-extension to any magnification and size of object likely to occur in practice.

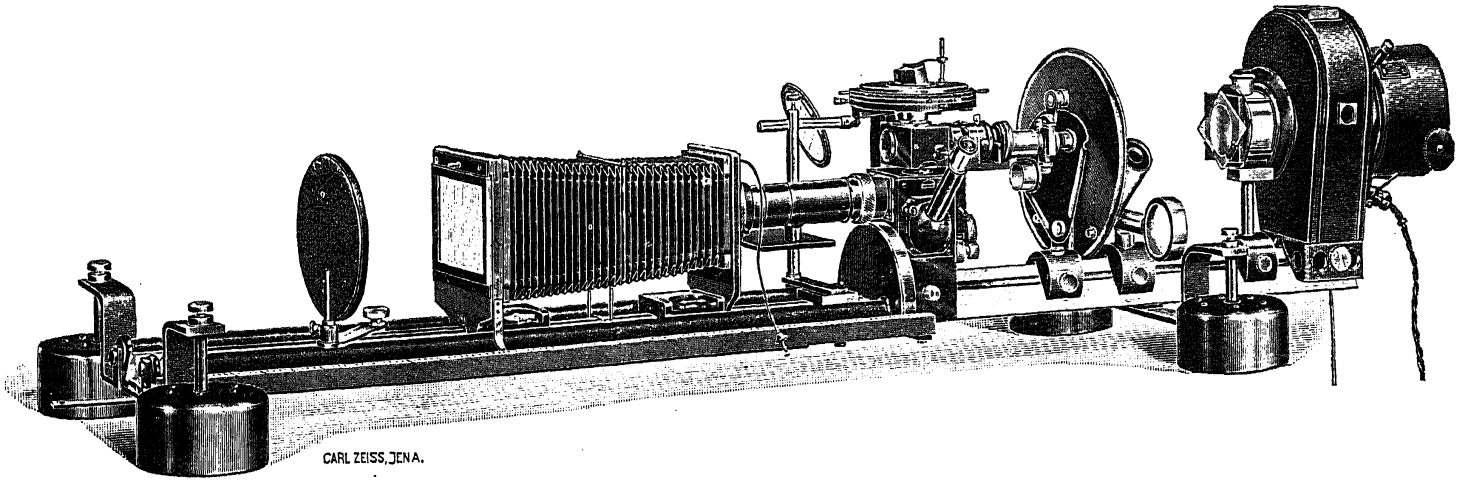

Fig. 1.

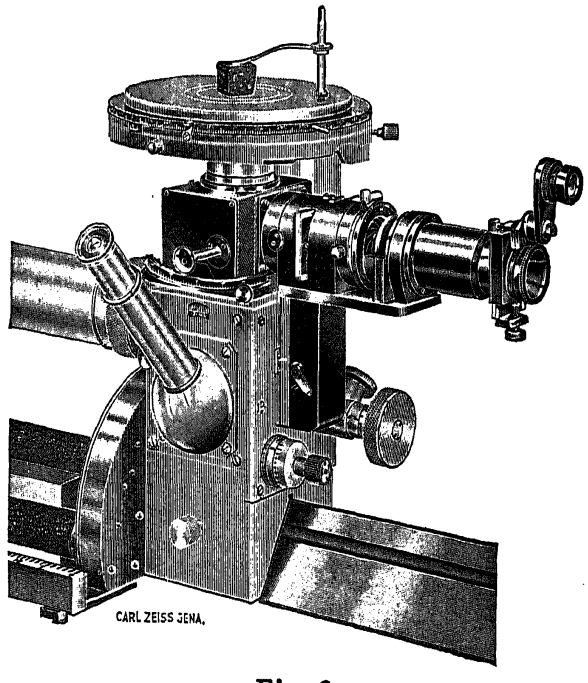

Fig. 2.

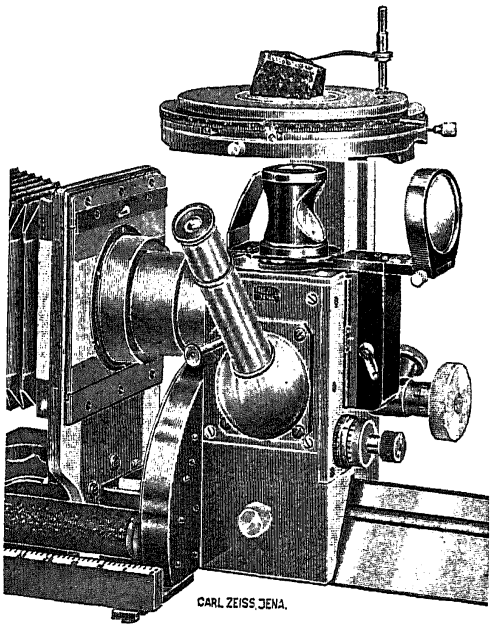

Fig. 3.

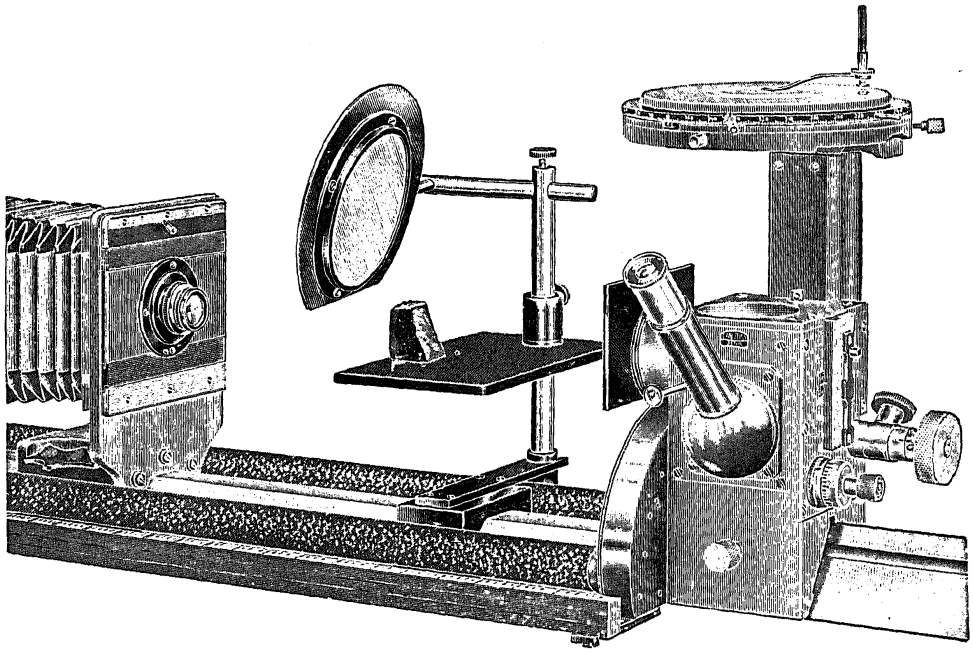

Fig. 4.

From among the many innovations embodied in the NEOPHOT, mention must be made of the remote control of the coarse and fine motions by means of two shafts, one on either side of the optical bench. These always remain in a fixed position and permit of convenient manipulation of the focussing motions from any standpoint beside the camera. A great deal of favourable comment is accorded by users to the anti-vibration mounting and to the swivelling filament lamp for visual examination in bright field which is attached to a screen designed to exclude stray light and saves the need for using the Arc Lamp for visual observation. The anti-vibration mounting functions dependably even in locations subject to severe vibrations.

The equipment for general survey photography with vertical illumination, by means of a plane glass and illuminating lens, can be easily exchanged for a sliding mirror and swivelling ground-glass which provide oblique illumination for the macrophotography of irregularly shaped objects.

Figure 4 shows the equipment for macrophotography of large objects. The object stage and illuminating mirror are simply swung into or out-of position as needed. The microscope stand need not be removed; screwing up the object stage in order to permit the rays to pass from the lamp to the mirror, is all that is required.

As has been experienced so far the NEOPHOT not only satisfies all demands relative to serial metallurgical and other industrial examinations but also represents the ideal and perfect apparatus for research.

Band Spectra and Valency—II.

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TWO POSSIBLE THEORIES OF VALENCY.

Both the theoretical bonding effects being always present a selection between the two postulates amounts to a choice as to which of these two effects is the more predominating. This involves considerations regarding the dissociation process and the dissociation energy, and therefore the method of molecular orbitals *per se* is not able to decide this question. It can be shown, however, that to reduce the phenomenon of chemical linkage to that of non-premotion is not justified already in the interpretation of the excited terms of H_2^+ all of which are unstable (with the exception of the premoted $3d\sigma\ (2p)$ which has a minimum at large internuclear distance) no matter, whether the electron is on a premoted orbital or on an unpremoted one. This appears significant, because the single bond interpretation of the method of molecular orbitals is a generalisation of the conditions in the molecule H_2^+.

The differences of the two conceptions are rather far reaching. They concern particularly the counting of valencies and the conceptions of chemical union itself. The first one we may discuss by taking up the case of the molecule CO. The electronic configuration of its ground-level contains six p-electrons, on which the linkage rests in any case and which form in the molecule the groups $\pi^4\ (2p)$ and $\sigma^2\ (2p)$. Both orbitals are non-premoted and according to the single electron bond interpretation in which the number of valencies equals the number of non-premoted pairs *minus* that of the premoted ones, those six electrons represent a triple link. According to the pair bond interpretation only those pairs contribute to the linkage, which are composed of electrons of either atom. The C atom possesses only two p-electrons and therefore only two out of the three pairs contribute to the linkage, the two remaining electrons of oxygen do not take part in it. The same configuration $\pi^4\ (2p)\ \sigma^2\ (2p)$ occurs again in N_2 but here also the pair bond interpretation recognises a triple bond, because each of the partners contributes three electrons. This distinction is by