measurement, and, of course, local examination of the property can therefore never be intended to displace the old methods of cadastral survey, but represents a new aid capable, under given conditions, of speeding up and bettering the economy of surveying operations. This will be particularly the case with higher-priced land, when, though photogrammetry does not yield the accuracy required for legal survey, it is used as the basis for the plotting sketch and the preliminary plan, and for complementing objects of importance from the civil engineering but not from legal point of view.

* This article is extracted from a longer article with the same title which is available in the Library of the Society.

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DISMANTLING THE STEREOPLANIGRAPH

by

Hans Gruner

"She certainly came down in a hurry!" That was the general verdict of those who in passing by witnessed the disassembling of the photogrammetric heavy-weight champion.

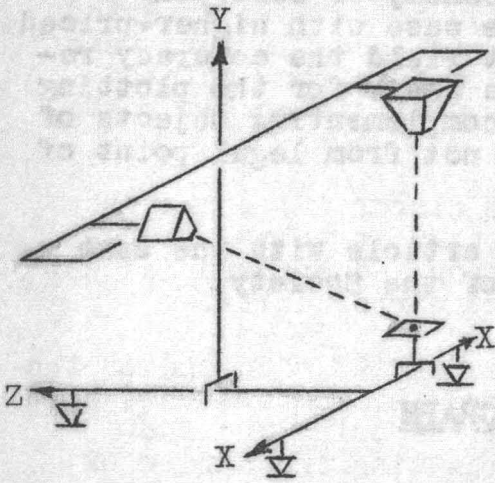
Those of our members who have seen the Stereoplanigraph in operation during its stay in the Interior Building in July, August and September will probably be in a position to visualize the process of dismantling from a mere description lacking photographic illustrations. Those who did not see the instrument may be contented with the statement that by this time the machine is on its way to the Los Angeles offices of the Fairchild Aerial Survey Corporation, via Panama Canal, solidly greased, wrapped, boxed, tin-sealed, and reboxed, in 19 containers most of which are steel reinforced and provided with proper hoisting facilities in order to protect their precious contents against the usually rough treatment during continental and maritime transit.

The job was done by two men temporarily assisted by four husky helpers in five and one-half days - from October 1st to 6th. When the machine arrived in Washington, early in June, the reverse operations of assembling and adjusting took 11 days for one man plus four occasional assistants.

Conforming to terms and designations used in the literature dealing with this instrument (*), the conventional three dimensional system of axes materialized by three tracks is shown in the diagram. The base of the instrument, a sturdy T-shaped beam bears the tracks of two horizontal axes X and Z. A vertical column of triangular cross-section rides on the Z-track and bears the rails for the Y-movement. The carriage which runs over them holds near the ends of two L-shaped horixontal arms the projecting apparatus, briefly called "cameras". They are detachable and

* The only comprehensive literature in English so far, may be found scattered through the book "Photogrammetry, Collected Lectures and Essays" by Chapman and Hall, London. We shall endeavor to supplement the literature by discussions in future News Notes.

may, therefore, be of the single or multiple lens type. The Washington equipment had two four-lens camera projects.



As shown in the simplified diagram, the two projections are received by a screen which bears a reference point called "measuring mark". The screen can be made to move along the X-track. As in reality, the two projected images are separated by the "instrumental base", and there are two screens and measuring marks, each one mounted on a "BX"-truck which can travel on the X-carriage. Since the observational system for the two projections are of the subjective type using transmitted light rather than employing the objective perception of the image by reflected light, the screens are articulated mirrors. They function like geodetic heliotropes by always reflecting a beam of light incident upon them into a stationary direction. This direction is the line of collimation of the observational system. These mirrors are automatically controlled by guide rods which are parts of what may be termed the "steering units", as they comprise a second device which also links the mirror units to the projecting lens systems. These so-called "invertors" function as safeguards against blurred imagery received upon the mirrors when the relative positions of (and therefore distances between) cameras and measuring marks are continuously changing in the course of operations; or, as an unbiased observer in more realistic terms would describe this portion: Two pairs of threatening rods on either side which are not good places to rest your elbows. It is this unit which also guides the lamps as they illuminate the portion of the aerial photograph which is projected onto the mirrors.

To precisely guide the respective carriages on the X, Y and Z-tracks, spindles transmit the movements of two handwheels and one footplate.

Now, after having built up this machine in our minds, let's take it down! As all the parts mentioned before are units which are adjusted in themselves, these units will come off without farther stripping of parts with exception of some small counterweights and reading glasses.

Probably we shall turn off the electricity first. That will kill the instrument's sonorous voice which had been oftentimes buzzing at 6 a.m. as well as it was echoed through the deserted vestibules at 10 p.m. Then we lift the most precious units, the cameras, out of their dove-tailed seats. There are special containers and an elaborate scaffold of wooden blocks and braces, inside of which every part is ingeniously suspended and securely fastened. Here we strike already a principle of the design which has been carried through all parts of the design with utmost fidelity. All bearings are freed of their

loads, all ball and roller bearings are lifted off their tracks when the machine is packed for transportation. In the case of the four-lens projectors, a set of stereoscopic photographs indicated the proper sequence of manipulations of positioning the units in their carrying cases. The carrying cases were inserted in tin-lined boxes stuffed with excelsior and these in turn were suspended from coil springs on all six sides in strong outside boxes. Providence makes safety and - reasonable insurance rates too!

Next we sever the connections between mirror units and the camera mounts by removing the steering units. It takes the removal of but one nut to disengage each mirror and one knurled cap screw to unfasten their tubular ends at the mirror units.

Another delicate part comes next - the "L" at each end of the horizontal arms of the Y-carriage. They are the members that hold the sleeves, linkages and the optics of the steering and the auxiliary focussing system. After a knurled ring and a pair of taper pins are removed, they can be pulled off the arms easily.

Then follows the arms themselves. The term "universal camera mount" would be more adequate for them as they embrace the control and clamp screws, gearing and graduated circles for the tilt and tip motion of the cameras, also the impressive "cannon balls" for counter weights to the cameras. Again, one internal screw bolt has to be turned a few revolutions to make these rather heavy pieces come off the Y-carriage.

The Y-carriage with the cameras, the "L" units, and the universal mounts now taken off is considerably reduced in weight. Fully assembled it had been counter-weighted accurately so as to make its travel up and down the track practically frictionless. In fact, with the driving spindle taken out and the 12 adjustable ball bearings of the carriage precisely aligned, the entire aggregate approaching the one ton mark will react gently upon a pressure of about four pounds.

Some of the counterweights hung to chains over the top of the Y-column and sliding inside and outside of it are to be taken off now. We decide for the outer one first. We crank the Y-carriage all the way up on its track and so make the outer weight come to rest on the base of the Y-column. There we detach the chain bracket, then we crank the carriage all the way down until it comes to rest at the base of the column. This brought the inner weight to its highest position where it now can be held by an auxiliary bar threaded through corresponding holes in the casting.

We now approach another interesting principle of design which is a complete departure from the conventional. There are an X, Y, and Z-spindle, each one driving a carriage over a certain length of track. The driven end of each spindle is linked to a universal joint by a double keyway. The other end is supported on a ball bearing whose housing is held to the casting by set pin, bolt and locknut. The driving nut, running along the worm of the spindle, is universally suspended in the carriage so as to permit departures

in a plane normal to the axis of the spindle but to check any play in the direction of the latter. Therefore, even though the spindle were bent slightly, this mechanism would function without jamming. Of course, the nuts are adjustable for wear of the threads.

In the adjoining operations of lifting the Y-carriage up and off its track, pushing the Y-column back and off its Z-track, the housing of the bearing on the far end of the spindle will be unscrewed, the spindle pulled back out of its keyway and screwed clear of the nut in the carriage. However, before this operation can be executed on the X-axis, it will be preceeded by three other stages of dismantling. The big optical head with its brain of glass will be taken off its stand after removal of three screws. Then the framelike mirror units which support the winding optical paths of the observation systems and the setting devices of the base components in the Y and Z directions will be lifted from their dovetailed seats on the BX-trucks, and finally the trucks themselves with their nut and spindle design conforming to that of the major axes will be dispatched.

At the end of these proceedings, the big base casting with the handwheels and the stand of the optical head is left on the floor. After you lift this away, or better watch six others doing it, there remains yet three floor plates and the foot plate to remind you - if you happen to be an operator - of the beauty and happiness embodied in the slogan of the modern photogrammetrist:

"Learn cranking without complaining".

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FIFTH CONGRESS OF THE INTERNATIONAL FEDERATION OF SURVEYORS

by

Earl Church

The fifth congress of the International Federation of Surveyors was held in London, England, from July 18 to 21. There were present 346 delegates from 21 countries, the United States being represented by Colonel James Gordon Steese and the writer.

This brief report is prepared with the thought that some American engineers may be interested in the proceedings of this conference. It is necessary, however, to confine these remarks to the discussion at the meetings of the committee on improvements in instruments and methods in surveying, one of the five technical committees into which the entire congress was divided.

Papers were presented at the meetings on many subjects concerning instruments and methods. The open discussions, however, were confined to two topics which were considered of the most outstanding importance, namely: (1) The polar coordinate method for locating details in cadastral surveying, with special attention to the methods for measuring distances; (2) The use of