

THE TOY ARTIST.

The mechanical toy shown in the accompanying illustration is one of the most original and ingenious things of its kind that have recently appeared. Within the base upon which the "artist" and his easel are placed, and immediately below the figure, is a small pinion which is operated by a worm at the end of the crankshaft which is seen projecting through the side of the base. The pinion, which rotates in a horizontal plane, is provided with a couple of pins upon which is placed one of the sets of removable cams which accompany the toy. The cams are double, being provided with two separate peripheral edges, and each edge is engaged by the short arm of a pair of levers, as shown in the engraving. The upper lever attaches at the end of its long arm to a vertical shaft, which passes up through the body of the figure, and is pivotally attached to its right arm at the shoulder. By this means the rotation of the cam causes a vertical up and down movement of the arm and the drawing pencil which it carries. The lower cam operates a system of levers by which the arm is given a series of right and left movements. It is evident that by giving the proper relative contours to the two edges of the cam, the arm, with the pencil which it carries, may be made to trace any desired line upon the paper, either vertical or horizontal, by the action of the first or second cam, or diagonal or curved, by the joint operation of the two. Each of the double cams which are provided with the toy is cut so that its operation will cause the figure to draw some well known object. The levers are kept in snug contact with the cams by a pair of spiral springs.

The easel is hinged to the base and is pressed against the pencil by means of a coil spring. It is provided with four projecting pins, upon which the sheet of paper is held while the sketch artist is at work. The model from which our engraving was made produced an easily recognized likeness of the Emperor William, of Germany (the device is "made in Germany"), and a drawing which bore a strong resemblance to the familiar barndoor fowl.

CAMERA FOR PRODUCING ENLARGED IMAGES OF MICROSCOPIC OBJECTS.

Owing to the improvements in microscope objectives and in photography, it is practicable to produce magnified photographic images of microscopical objects which are not only interesting to the microscopist, but are also of importance to the pathologist and histologist in making a record.

We illustrate photo-micrographic apparatus recently completed by Mr. O. G. Mason, microscopist of Bellevue Hospital, and for many years secretary of the American Microscopical Society.

This apparatus will receive an objective of any power, and produces images on a $3\frac{1}{4}$ by $4\frac{1}{4}$ plate. The apparatus is very compact, being only about two feet in length. It is all mounted on a single base board, so that it may be moved bodily if it becomes necessary to shift its position.

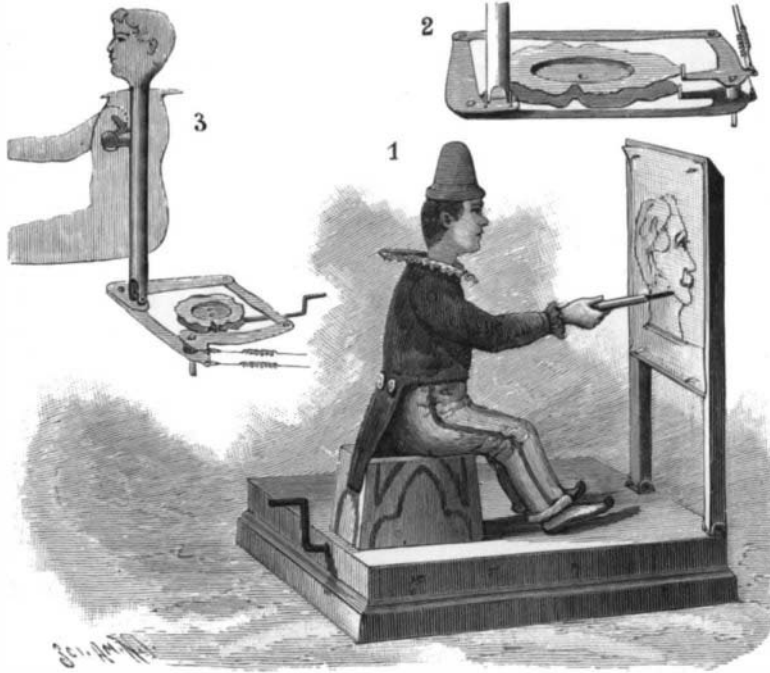
The camera box is rigidly attached to the standard of a microscope of the usual form, so that the box can be placed horizontally or inclined at any desired angle. Adjustments are made which provide for any required distance between the objective and the sensitive plate, so that the desired amplification may be readily secured. The mechanical stage is operated by the small chains which extend along the sides of the frame of the apparatus, and the rotation of the objective, polariscope, etc., and the focusing are effected by rods extended toward the rear of the camera box. With these adjustments the operator seated at the camera can manipulate the instrument for focusing or searching the field for any particular object.

The instrument has been used for making negatives showing objects with a magnification of 15,000 times. All the parts are made adjustable for wear and atmospheric changes and for adaptation to various classes of work.

This photomicrographic apparatus forms an important part of the equipment of the laboratory of microscopy of Bellevue Hospital.

The Apostoloff Telephone.

In telephony, as at present practiced, the amount of space required for the various stations and exchanges, the large staff of attendants that must be employed to carry on the work of these exchanges with efficiency, and the complication of the electrical arrangements necessary to cope with a numerous body of subscribers constitute a serious practical hindrance. The capacity of a single exchange on the system now worked may be said to be limited to hundreds of subscribers, while one central station capable of dealing directly with 10,000



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subscribers and putting any one of them into communication with any other would be all but a physical impossibility, owing to the huge number of contacts and connections, to be numbered perhaps in hundreds of millions, which would be required for its conduct. The Apostoloff automatic telephone is a device by which it is claimed that a station of such size is rendered perfectly feasible, because the number of contacts and connections just referred to is so far reduced as to be within workable limits, says the London Times.

In the central station each subscriber is represented by a piece of apparatus contained in a box a few inches high, which is connected by an ordinary metallic circuit to the telephone in his house or office. When it is remembered that he is thus enabled to communicate with any other subscriber without the intervention of any attendant whatsoever, it will easily be imagined that the details of the electric mechanism are very intricate and complicated. The general principle, however, is simple enough, as are the operations by which communication is effected. Ordinary telephones are used with the addition of a small piece of apparatus

hand button have passed through a polarized relay and caused a local battery to send 17 successive currents through an electromagnet which has moved a traveling switch step by step past 16 contacts, each representing a group of 100 subscribers, until it has stopped on the 17th of the row. The negative currents have in the same way moved a second traveling switch till it is in connection with the 95th contact of the other row. The subscriber now presses another button, which causes the words "Ring up" to appear in the middle aperture. At the same time, by an ingenious electrical arrangement, the electromagnets that actuate the traveling switches are cut out and the circuit is completed to 1,795. He now rings up in the usual way, and in return 1,795, if he wishes to speak, presses one of his buttons and causes the words "Are you there?" to appear in both transmitters. Conversation is now possible. After finishing, both subscribers touch a button marked "Finish," whereupon the numbers in the windows fly back to zero, "Off" appears in the middle window, the traveling switches in the apparatus at the central station return to their initial position, and the whole apparatus is ready to be used again.

It is claimed that this invention is easily and inexpensively adaptable to existing telephone systems having complete metallic circuits, that it does away with the heavy expenses of large central and branch exchanges and of the numerous staff they necessitate, that it means a great saving of time and does not leave subscribers at the mercy of the attendants at the various exchanges, that it insures clear and loud speaking, and that it will permit of an immense expansion in the use of telephones.

It is to be noted that the co-operation of the two subscribers concerned, and of them only, is necessary to establish communication, and that when once that is effected it is impossible for a third subscriber to interfere in any way without the sanction of the two who are speaking. Absolute secrecy is therefore assured.

Statistics of Convict Labor in the United States.

Commissioner of Labor Carroll D. Wright has recently issued a bulletin about convict labor in the United States. The total number of convicts in penal institutions in the various States, in 1885, was 41,887. In 1895 the number rose to 54,244. Of the number imprisoned in 1885, 1,967 were females. The number of females imprisoned in 1895 was 1,988, an increase of only 21. In 1885 the number engaged in productive labor was 30,853, 73.7 per cent of the total number, while in 1895 the number engaged in productive labor was 38,415, or 70.8 per cent. There was also a decrease in the proportion of those engaged in prison duties: in 1885 the total was 8,391, or 20 per cent, while in 1895 there were 8,804, 16.2 per cent. In 1885 the number of idle and sick was 2,633, or 6.3 per cent; 1895, 7,025, 13 per cent.

An increase in the amount of work done in penal institutions during 1895 occurred in Alabama, Connecticut, Florida, Maryland, Massachusetts, Minnesota, Missouri, New Hampshire, New Mexico, Rhode Island, South Carolina, Texas, Vermont, Virginia, Washington, and Wisconsin. A decrease occurred in Arizona, Arkansas, California, Colorado, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Michigan, Mississippi, Nebraska, Nevada, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Dakota, Tennessee, and West Virginia. The total value of goods produced or work done in the United States for the various States and Territories in all the State prisons and penitentiaries for 1895 was \$19,042,472.

In 1885 the total wages paid by contractors and lessees for the labor of convicts, from which resulted a product of the value of \$28,753,999, was only \$3,512,970, or \$1 of convict labor wages to \$8.19 of finished product of convict labor. At the present time, in all probability, the total value of the labor expended by the convicts in the State penitentiaries and prisons of the country does not exceed \$2,500,000.

THE ironwork of the dome of the Yerkes observatory is in place. It is 90 ft. in diameter and weighs 200 tons.

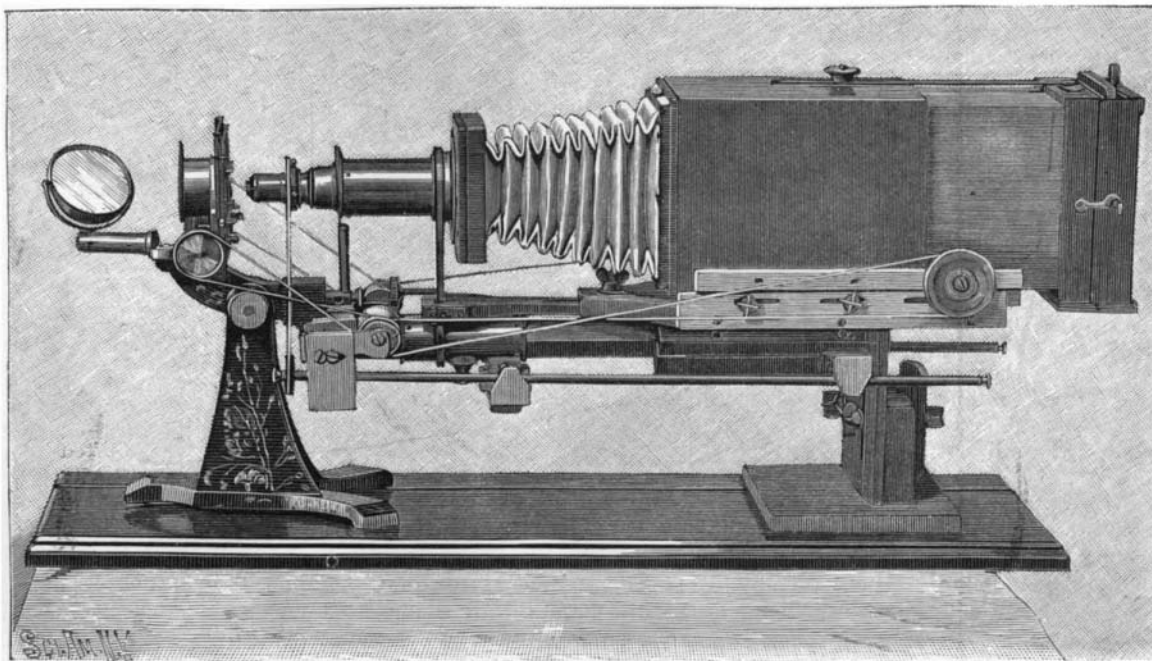


PHOTO-MICROGRAPHIC APPARATUS.

termed a "transmitter" or "manipulator." The face of this transmitter is pierced with three little windows or apertures, in two of which numerals appear and in the third certain service indications. Suppose a subscriber wishes to speak with No. 1,795. He presses a button under the left hand aperture until the numerals 17 appear. He then does the same to a button under the right hand window until 95 appears. These two operations have produced corresponding movements in the instrument that represents him at the central station. The positive currents sent by the left