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# Speeds of Jupiter

By R. S. Radow

**S**PEED! What thoughts does this word convey to your mind? No doubt you immediately think of its relationship to automobiles traveling 272 miles per hour and airplanes racing at 400 miles per hour. Those are your thoughts of today. Ten years ago you probably made this exclamation while traveling 40 or 45 m. p. h. in an open car: "By Jupiter, we're goin' like sixty!" Yet we never give much thought to the extent which these speeds are exceeded. What of light and electricity? As we all know, they travel approximately 186,000 miles per second. It is their speeds which make possible many of the miraculous achievements of today. When complete control of their properties is a fact, we will probably be astonished at what can and will be accomplished. Nevertheless we are capable of controlling and utilizing them whereby they are performing what would have been called miracles by our fathers and grandperes.

We are progressing. Perhaps the latest achievement of engineers is the transmission of pictures thousands of miles in a few minutes. For example, a major catastrophe occurs in Maine. Perhaps an hour later news and pictures of said catastrophe are being read and seen by people in California. Speed! That is what has been accomplished by the new Associated Press Wire-photography.

Let us look back and survey the developments leading to this new telephotography of such high quality. Thirty-four years ago a New York paper used a half-tone engraving, which represented the first in the history of journalism. This marked the advent of pictures in newspapers. Year after year these pictures improved. Pictures of events in one city were sent to other cities to be published. Much money was spent to hasten modes of transportation of these pictures. Even human life was endangered, not intentionally, of course. Couriers, trains, airplanes, and mail all comprised methods employed. Then about 10 years ago the old system of telephotos was put into use and although the transmitted pictures do not compare with those of today, it was indeed a step in the advancement and progress toward what we now have realized.

What does the new system mean to the average newspaper reader? It means that pictures of events will be viewed by him almost as soon as he reads the news itself. The transmission of pictures has been cut down to a matter of minutes.

Pictures of exciting or timely occurrences are snapped

by the photographer. The negative is developed and positive prints are made. This is the actual picture developed somewhat similar to pictures which we snap with our kodaks. This positive print is placed in the telephotograph machine. It is inserted on a cylinder in the sending apparatus. A photographic negative is put on a similar cylinder at the receiving station. The machines are so arranged that a sending operator can talk to any point on the receiving end or carry on a two-way conversation with any one point. After both operators are ready, a switch is turned which immediately starts both cylinders revolving synchronously at 100 times per minute. Perfect harmony of the motion of these cylinders is essential to the successful transmission of the picture. This accuracy is accomplished by a very novel apparatus. A tuning fork is enclosed in a container somewhat similar to a thermos bottle. The fork vibrates 300 times a second in a constant temperature of 122° F. Electrical relays and other devices guard its steadiness to insure that those of all other sending and receiving stations maintain the same vibrations.

As these cylinders revolve, a beam of light 1/10,000 of a square inch is cast at an angle of 45° onto the positive print in the sending machine. This beam is produced by a bulb of size similar to an auto headlight lamp. Mirrors transmit the beam through a slot 1/100 inch square. In this slot is a U-shaped wire—of diameter about one-fifth that of the human hair—which is vibrated by electricity 2400 times a second, thus chopping up the light beam into 2400 segments per second. The beam is reflected through a light valve which opens and shuts at the rate of 1200 times each second. The intensity of the light beam at any instant is proportional to the darkness or lightness of the minute spot on the picture from which it was reflected. To those who know the principles of television, its relation in that respect can easily be seen. This reflection falls upon a photo-electric cell which varies an electric current in comparison to the intensity of the reflected light. The brighter the light, the larger the quantity of electrons which are freed in the photo-electric cell and hence the greater the current at that instant.

These currents are amplified and transmitted by wire to the receiving station. The chopped-up impulses are smoothed out by a filter which results in the removing of the 240 cycle carrier wire. These impulses operate a light valve which allows an amount of light corresponding to the intensity of the impulse—which in the first place corresponded to the shading on the original picture—

to fall upon the negative plate. Due to the synchronization present, which is 1 to 500,000 maximum error, the negative is so affected that it will, when developed, produce pictures exactly as the original picture.

These pictures are so nearly alike that even experienced men have difficulty in telling which is which, when they are placed side by side. Another distinct advantage of these pictures over those produced by the old system is the fact that as heretofore only 5" x 7" pictures could be transmitted, it is now possible to transmit pictures 12" x 20". No enlargement, which brought out imperfections in the old type, is necessary.

This new Wirephoto service now in use required 10,000 miles of the highest grade of telephone wires reaching into all of the large cities in the United States. The new machines cost \$16,000 each.

This revolutionized system of telephotography was developed in the Bell telephone laboratory at New York. Their widespread researches and successes prophesy greater speed, more speed, which means the instantaneous transmission of pictures—television!

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