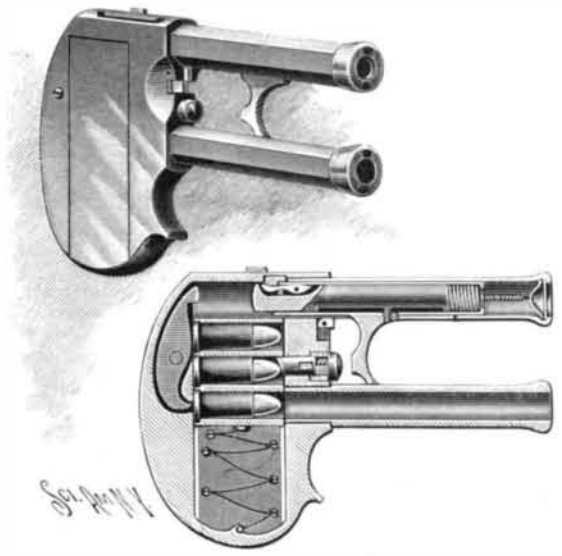
A NOVEL REPEATING PISTOL.

A pistol especially designed to be conveniently carried in the pocket by bicyclists and others wearing somewhat closely fitting garments, and which may be held more steadily than the ordinary pistol when firing, is represented in the accompanying illustration and has been patented by August Nygren, of Elizabeth, Minn. According to this improvement, the extreme length of a 32 caliber weapon is designed to be 4¾ inches, of which the barrel measures 4¼ inches from the rim of the cartridge, the depth being 3¼ inches and the thickness at the thickest part $\frac{9}{16}$ inch. The ball is ejected from the lower one of the two barrels, the other carrying the bolt mechanism and the trigger being located between the two barrels, the feed device presenting a cartridge each time that the trigger is pulled and released. As shown in the sectional view, both barrels are in communication with a chamber in the grip or handle section, a cartridge block sliding on ribs in this chamber having separate partitions to accommodate three or more cartridges and a spring normally tending to draw the cartridge block downward. The trigger is attached to the bottom side of a cylindrical jacket sliding in the upper barrel, and in this jacket slides the firing bolt, against the front end of which bears a spiral spring, while a spring of less strength connects the front end of the bolt with a loop or keeper extending across the front end of the upper barrel. In a recess near the heel of the firing bolt is pivoted a spring-

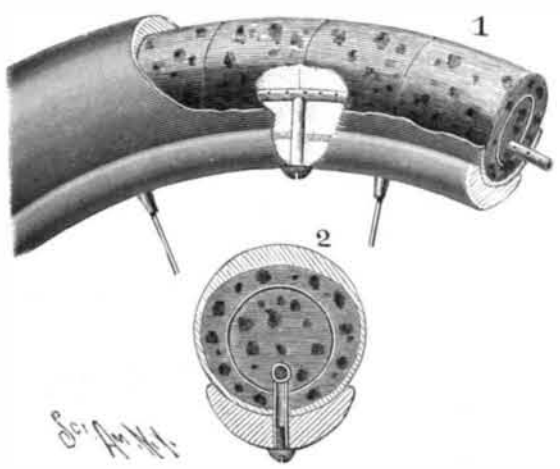


NYGREN'S MAGAZINE PISTOL.

pressed pawl, normally locking the firing bolt from backward movement, but with the forcing backward of the cylindrical jacket by pulling on the trigger, the pawl is released, when the compressed spiral spring drives the firing bolt violently into contact with the head of a pivoted firing pin in the rear of the magazine chamber, causing the firing point of the pin to suddenly strike the cap of the cartridge in the lower chamber of the cartridge block. After firing, the jacket and firing bolt are drawn back to normal position by the spring extending to the front end of the upper barrel. A safety catch is provided, by the use of which the trigger may be locked against movement when the weapon is not likely to be used.

A PUNCTURE-PROOF TIRE.

A tire which is puncture-proof, and designed to possess the resiliency, elasticity and other desirable qualities of a pneumatic tire, without any of its disadvantages, is represented in the accompanying illustration, and has been patented by Franz A. Hamp, of No. 210 East Pearl Street, Cincinnati, O. Fig. 1 is a view in perspective of a portion of the rim and of the tire, the



HAMP'S PUNCTURE-PROOF TIRE.

outer covering of the latter being partly broken away, while Fig. 2 shows a cross section of the tire and rim. The body of the tire consists of a suitable number of cork sections, nearly cylindrical in shape, glued or cemented together, inclosed by rubber tubing, the latter of greatly increased thickness on the tread portion. It is provided that the cork sections may, if desired, be made concave, or straight, or angular, on their tread portion, and thus allow for a corresponding enlargement and fitting of the tread portion of the rubber covering thereon. Each cork section of the tire has a tubular opening, which, when the sections are connected together, constitutes a continuous tubular channel, in portions of which, preferably at opposite inner faces of the tire, are introduced perforated tubes of aluminum or other metal, as shown in Fig. 1, each tube being connected with a branch tube extending through the rim of the wheel. The outer ends of the branch tubes are closed by screws, which serve also to hold the tire to an engagement with the rim, and it is designed to introduce through these tubes, to the interior of the tire, a fluid consisting of amyl alcohol, margaric acid and glycerine, to keep the cork elastic and moist, and preserve the rubber and prevent it from cracking or becoming hard. Rings are also pressed into each end of each cork section, to protect the tire against extraordinary pressure, and these rings are preferably connected together with a rod or other device. It will be seen that, no matter to what degree the outer covering of the tire may be damaged, it will still be serviceable.

Nativity of Pullman Wage Earners.

An interesting table has been compiled by Duane Doty, civil engineer of the company, showing the nativity and the length of service of the 4,803 wage earners at Pullman. It is as follows, says The Industrial World :

Where born.	Number.	Number of each type.
American—		
United States	1,491	1,491
Scandinavian—		
Denmark	63	
Finland	6	
Norway	90	
Sweden	962	1,121
German—		
Austria	62	
Bohemia	17	
Other German states	552	631
British—		
Canada	214	
England	290	
Scotland	90	
Wales	23	617
Dutch—		
Holland	518	518
Irish—		
Ireland	182	182
Latin—		
Belgium	4	
France	5	
Italy	96	
Switzerland	17	122
All others—		
Hungary	19	
Poland	85	
Russia	13	
Other countries	4	121
Totals	4,803	4,803

Number of wage earners who have been dwellers at Pullman :

Seventeen years		52
Sixteen	"	200
Fifteen	"	170
Fourteen	"	219
Thirteen	"	202
Twelve	"	250
Eleven	"	171
Ten	"	324
Nine	"	277
Eight	"	270
Seven	"	341
Six	"	378
Five	"	381
Four	"	310
Three	"	340
Two	"	416
One	"	502
		4,803

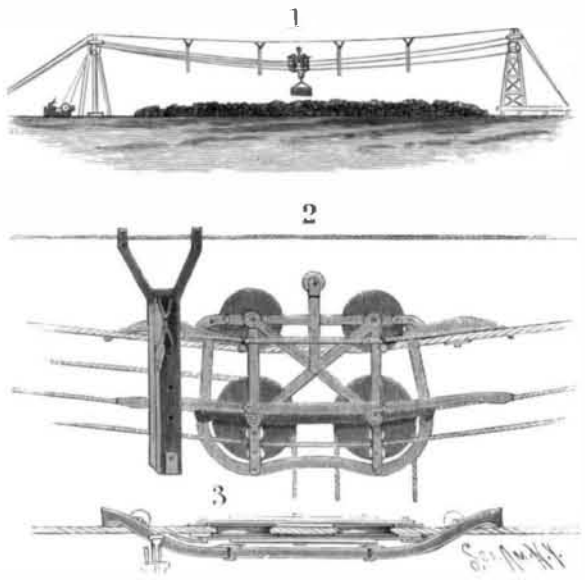
Whole number of males	4,575
Whole number of females	228
Number owning their homes	958
Number not living or boarding in Pullman	2,024

Or 42 per cent of the whole number.

The average length of time these operatives have lived here or in this immediate neighborhood is seven and a half years.

A CABLEWAY CARRIER AND CARRIAGE.

The illustration represents an aerial hoisting and transportation apparatus by which the hoisting rope and endless carriage rope are properly supported and the carriage is automatically switched past the carriers. The invention has been patented by Carl E. Richson, of Brooklyn, N. Y., and is being introduced by Gus. Pers. Wern, M.E., of the De la Vergne Refrigerating Machine Company, foot of East 138th Street, New York City. A fixed rope or cable suspended across the space between towers or elevated points, as shown in Fig. 1, carries a series of hangers which support a main cable forming a track for the carriage from which the load is suspended, the hangers having means to engage the cable and pulleys to support the hoisting rope and the endless carriage rope, and there being means for switching the carriage past the hangers and returning the cable and the ropes to the hangers after the carriage has passed. On the cable below the one supporting the hangers travel pulleys journaled in the frame of the carriage, the latter being connected, as usual, with an endless rope passing over pulleys on the towers, to wind on a suitable windlass, for moving the carriage backward and forward, there being also in the frame of the carriage pulleys over which pass a hoisting rope connected with suitable mechanism for raising and lowering the load. Fig. 2 represents an enlarged side view of the carriage and one of the hangers, Fig. 3 being a plan view. To allow the carriage to pass the hangers, the

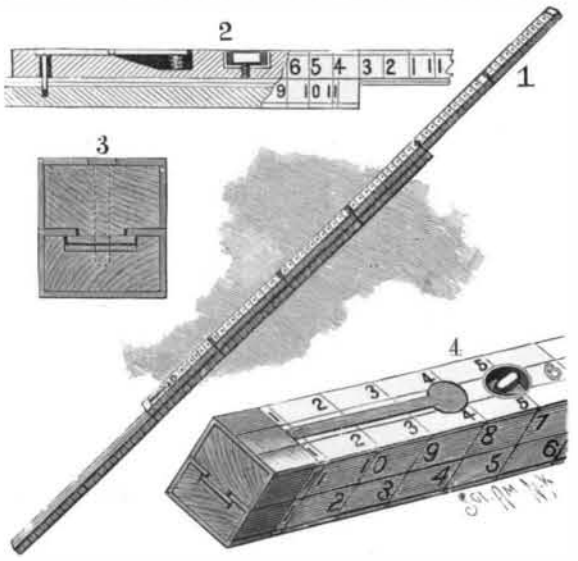


RICHSON'S SUSPENSION CABLEWAY CARRIER AND CARRIAGE.

carriage frame is provided with a sectional track, pivoted end sections of which are arranged to swing up and down relatively to a fixed central section, the end sections being also curved to swing over to the other side of the cable, as indicated in Fig. 3, there being on the outer ends of these sections pulleys adapted to travel on the cable, springs pressing on the hinged end sections to hold the pulleys in engagement with the cable. On each of the hangers is a transverse lever carrying at its free end a wheel extended from the inner face of the support to engage the track on the carriage at either of its end sections, according to the direction in which the carriage is traveling, the arrangement being such that the carriage and hanger will be moved laterally apart as the carriage passes the hanger, the cable and ropes being lifted off their pulleys for this purpose and again returned to them after the carriage has passed the hanger. In this manner the hoisting rope and the carriage rope are suitably supported at intervals on the hangers, so that none of the rope is slack.

AN EXTENSIBLE MEASURING POLE.

A pole for making lineal measures, and which may be readily extended in length, being without projecting parts and composed of sections adapted to slide on



HEGARTY'S MEASURING POLE.

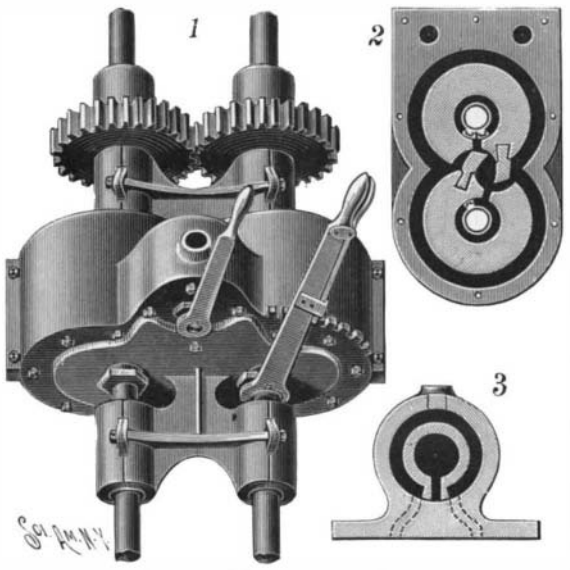
each other, is shown in the accompanying illustration, and has been patented by Reuben Hegarty, of Madera, Pa. Fig. 1 shows the complete pole, partially extended, Figs. 2 and 3 representing lengthwise and transverse sections and Fig. 4 a view of one end. The two members of the pole are held together against lateral play, but capable of lengthwise movement, by means of a flanged rib on one member fitting in a correspondingly flanged groove in the other member. To hold the members rigid with relation to each other, a spring-pressed detent in one member carries at its outer end a pin adapted to enter one of a series of openings in the meeting face of the other member, as shown in Fig. 2, while to hold the members adjusted at any other point a thumb-screw located in one member is adapted to be brought to a wedging engagement with the other member, both the thumb-screw and the detent lying entirely within their respective recesses, so that there are no projecting parts.

Action of Cathode Rays.

Goldstein was the first to discover that common salt is colored brown and potassium chloride violet by the action of the cathode rays, says The Engineering and Mining Journal. The discoverer attributed this phenomenon to some physical change undergone by the salts. Wiedemann and Schmidt attributed it to their partial conversion into subchloride, and Giesel actually succeeded in preparing similarly colored subchlorides in a chemical way. But the chemical hypothesis is now invalidated by the researches of R. Abegg. He obtained the salts in question in a pure and finely powdered state, so as to be able to color them all through. His first experiments showed that the coloring does not spoil the vacuum in the tube, as it would if chlorine were evolved. The salts were rendered colorless again by high exhaustion, producing rays with a strong heating effect. The substances could be colored and uncolored any number of times in succession. When the colored salt was dissolved it produced no reducing or alkaline reaction. When undissolved in a saturated solution it retained its color. All this tells against a chemical change. Moreover, an easily reduced chloride is not reduced by the cathode rays. It is well to remember that the coloration of these alkaline salts is a phenomenon not produced by light. On the other hand, cuprous chloride is blackened by light, but not acted upon by the cathode rays.

AN IMPROVED ROTARY ENGINE.

In the engine shown in the illustration all the movements are rotary, enabling the engine to be run at very high speed, as high as 8,000 to 10,000 revolutions per minute being claimed for it. It is fitted with valve gears adjustable to cut off the steam as desired, thus enabling the steam to be used expansively, and the valves are arranged to take up their own wear and always remain perfectly tight. The invention has been patented by Carl Engberg, of St. Joseph, Mich. Fig. 1 represents the engine in perspective, Fig. 2 being a sectional view of the cylinders and pistons and Fig. 3 a section of the steam chest and inlet valve. The shafts on which the pistons are secured are connected with each other by gear wheels, one of which is adjustable to bring the pistons in proper relation to each other, at the same time permitting the rotary motion of one shaft to be transmitted to the other, and in the body of each piston is dovetailed a piston head, the piston heads being adapted to pass each other in recesses formed in the pistons. The ends of the pistons, as well as their outer faces and the cylindrical heads adjacent



ENGBERG'S ROTARY ENGINE.

thereto, are fitted with suitable packing to prevent leakage and take up wear. The recesses at either side of the piston heads are connected by ports with annular recesses in the pistons, surrounding the shaft, and into each of these recesses extends a sleeve whose outer end is adapted to receive a hand lever adapted to be locked to a notched segment, whereby the steam may be cut off at different points of the revolution of the piston. The annular recesses are also connected with ports leading to the steam chest, the inlet valve controlling which may be readily adjusted to reverse the engine. The engine is perfectly balanced, so that it can be run at a high speed without the least vibration, being thus especially valuable for running dynamos, and is very light for the power it is designed to develop.

PHOSPHORUS may be prepared in the electric furnace from calcium phosphate. A mixture of this salt with carbon and sand or alumina is heated in an atmosphere of some gas neutral to phosphorus, such as coal gas, and the phosphorus which distills over is collected under water. According to Mr. Readman, 86 per cent of the phosphorus contained in the original mixture is obtained, and the product is found to be very pure.—Stahl und Eisen.

THE PLANET VENUS.

Of the planets, Venus is the one that approaches nearest to the earth; and her dimensions are almost the same as those of the latter. Nearer to the sun than we are, she effects her revolution around it in 224½ days; but her distance from the earth greatly varies. As her distance from the sun is about two-thirds of the radius of the terrestrial orbit, it will be seen that when she is in inferior conjunction, that is to say, between us and the sun, her distance from the earth is only a third of that of the sun from the latter. Her apparent dimensions naturally vary in inverse proportion; and, moreover, she presents the phenomenon of phases. At the epoch of inferior conjunction she turns toward us that one of her two hemispheres which is not illuminared and is consequently invisible to us.

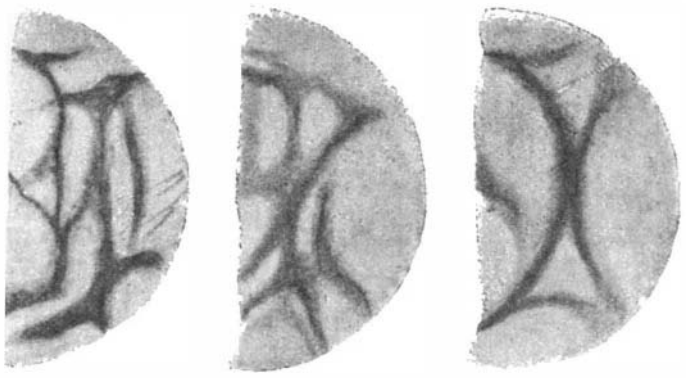


Fig. 2.—VENUS AS OBSERVED BY M. FONTSERE.

Fig. 1.—VENUS AS OBSERVED BY SIR WILLIAM HERSCHEL.

A few days afterward she appears to us in the form of a slender crescent, which continues to widen more and more in measure as she seems to become more distant from the sun on the west side. It is then that we see her shining in the morning before sunrise and that she is called the "Morning Star." She gradually assumes the form of a half moon, and then the visible part further enlarges, and finally comes the superior conjunction, in which she presents to us the whole of her illuminated hemisphere. Unfortunately, she then appears alongside of the sun and is lost in the splendor of his light. Then her apparent figure undergoes the same modifications in an opposite direction, while she appears in the evening to the east of the sun until the epoch of the new inferior conjunction. It must be added that, on account of the variations in the distance of Venus from the earth, the apparent diameter of the planet is so much the greater in proportion as the phase is more pronounced. It is when she appears in the form of a slender crescent that her diameter seems greatest. Fig. 4 shows the different aspects of the planet, with their relative apparent sizes. We shall not dwell upon this farther, but we have thought it well to recall all these circumstances in order to show how unfavorable they are for observations; added to which, among other difficulties, is the fact that we never see the planet's entire disk. So it is not surprising that the knowledge that we possess as to this planet is much less advanced than that which we have been able to acquire concerning the moon or the planet Mars.

There is one thing certain, however, and that is that Venus is surrounded by an atmosphere much denser and much higher than that of the earth. The existence and thickness of this atmosphere reveal themselves to our eyes (1) by the penumbra that accompanies the internal limit of the crescent, and that corresponds to the twilight of the places on Venus for which the sun rises and sets; (2) by the prolongation of the horns of the crescent beyond their geometrical limit; (3) by the fact that the external edge of the planet is always more brilliant than the central region; and (4) by the observations made at the time of the last passage of Venus over the sun's disk, and which showed, at the moment at which Venus' disk had half entered upon that of the sun in the form of a black semicircle, that the part of Venus remaining external to the sun was surrounded by a narrow luminous ring produced by the illumination of the atmosphere (Fig. 5). M. Bouquet de la Grye, who has discussed these observations, estimates that the atmosphere of Venus is five times higher than that of the earth. Finally, spectrum analysis has shown aqueous vapor in this atmosphere, and hence it is allowable to conclude that more or less opaque clouds exist. So this atmospheric stratum, which acts as a veil to conceal the solid part of the planet from us, constitutes still another difficulty.

The first problem to be solved would be that of the determination of the rotation of the planet and of the position of its axis. Now, as regards this, the opinions of astronomers have singularly varied. The reason of this is that, in order to solve the problem, it would be necessary to distinguish persistent spots upon the surface of the planet and follow their apparent motion, as has been done with the moon, the sun, Mars and Jupiter. Unfortunately, we see almost nothing upon the planet Venus. Many astronomers have never seen here anything but a surface of a uniform white. Others have seen, or thought they have seen, dark or white spots. But such spots are scarcely perceptible and without exact contours, and are nothing more than fugacious and ill-determined shadows. Another curious circumstance is that, although the drawings made by the same observer present some resemblances to each other, those obtained by different observers are entirely dissimilar, as one may convince himself by examining the engravings which accompany this article. It has never been possible to identify upon Venus, as it has been upon Mars, two spots seen by different observers. So the maps of Venus that have been published a little too hastily are absolutely illusory.

The first observations date back to Dominique Cassini, who made them at Bologna in 1666 and 1667. We give (Fig. 3, No. 1) one of Cassini's sketches repro

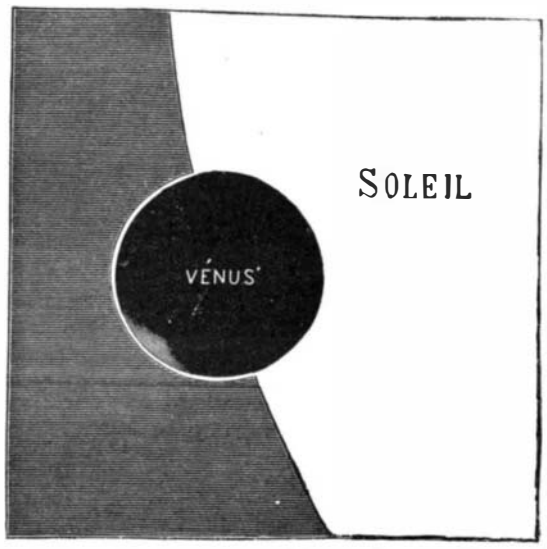


Fig 5.—LUMINOUS RING PRODUCED AROUND VENUS BY THE REFRACTION OF THE SOLAR LIGHT THROUGH ITS ATMOSPHERE AT THE MOMENT OF ITS PASSAGE OVER THE SOLAR DISK.

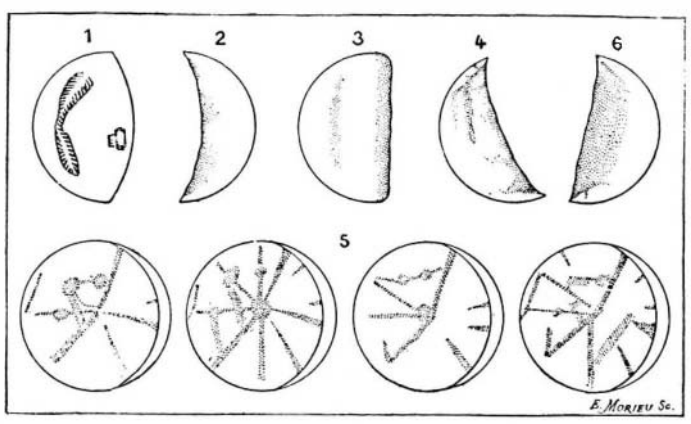


Fig. 3.—OBSERVATIONS OF VENUS.

No. 1, by Cassini; No. 2, by Bianchini; No. 3, by Schroeter; No. 4, by Schiaparelli; No. 5, by Lowell; No. 6, by Flammarion and Antoniadi.

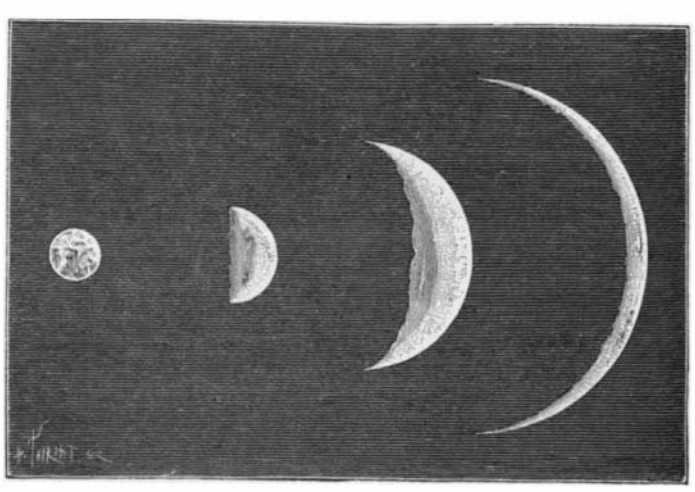


Fig. 4.—PHASES OF THE PLANET VENUS—ASPECTS AND APPARENT DIMENSIONS AT DIFFERENT EPOCHS.