Correspondence.

Dividing Circles.

To the Editor of the Scientific American:

From reading the articles by Mr. Joshua Rose, entitled "Practical Mechanism," I know that he is one of the best and most practical mechanics that have seen fit to impart their knowledge to their fellow craftsmen through the medium of any scientific paper; and his articles are the first I turn to upon opening the SCIENTIFIC AMERICAN.

In elucidation of a method of dividing a circle into a given number of parts, spoken of by him on page 84 of your current volume, let me remind your readers that a correct way of doing this is to divide 360° by the requisite number of sides in the polygon, find the chord of the quotient, and multiply by the radius. I have calculated the following table by the above rule, which, upon inspection, will be found to give correct results.

Table of Chords and Angles of Figures Described in a Circle, from Triangles to Polygons with 100 *Sides.—Calculated to* 1 *Minute of the Arc and to* 0·0001 *of Radius.—Radius* =1·0000.

No. of sides.	Angle.	Chord.	No. of sides.	Angle.	Chord.	No. of sides.	Angle.	Chord.
3	120°00′	1·7321	36	10°00′	0·1743	69	5°13′	0·0910
4	90 00	1·4142	37	9 44	0·1697	70	5 09	0 0898
5	72 00	1·1756	38	9 28	0·1651	71	5 04	0 0884
6	60 00	1·0000	39	9 14	0·1610	72	5 00	0 0872
7	51 26	0 8678	40	9 00	0·1569	73	4 56	0 0861
8	45 00	0 7654	41	8 47	0·1531	74	4 52	0 0849
9	40 00	0·6840	42	8 34	0·1495	75	4 48	0·0838
10	36 00	0 6180	43	8 22	0·1460	76	4 44	0·0826
11	32 44	0·5636	44	8 11	0·1427	77	4 41	0 0816
12	30 00	0·5176	45	8 00	0·1395	78	4 37	0·0806
13	27 42	0 4787	46	7 50	0·1365	79	4 33	0·0795
14	25 43	0·4451	47	7 40	0·1336	80	4 30	0·0785
15	24 00	0·4158	48	7 30	0·1308	81	4 27	0·0776
16	22 30	0·3902	49	7 21	0·1282	82	4 23	0·0766
17	21 11	0·3676	50	7 12	0·1256	83	4 20	0·0756
18	20 00	0·3473	51	7 04	0·1232	84	4 17	0·0747
19	18 57	0·3292	52	6 55	0·1207	85	4 14	0·0739
20	18 00	0·3129	53	6 48	0 1185	86	4 11	0·0730
21	17 09	0·2981	54	6 40	0·1163	87	4 08	0 0722
22	16 22	0·2847	55	6 33	0·1142	88	4 05	0·0714
23	15 39	0·2723	56	6 26	0·1121	89	4 03	0 0706
24	15 00	0·2611	57	6 19	0·1102	90	4 00	0·0698
25	14 24	0 2507	58	6 12	0·1083	91	3 57	0·0690
26	13 51	0·2411	59	6 06	0 1064	92	3 55	0·0683
27	13 20	0·2322	60	6 00	0·1047	93	3 52	0 0675
28	12 51	0·2239	61	5 54	0 1029	94	3 50	0·0669
29	12 25	0·2163	62	5 48	0·1013	95	3 47	0·0661
30	12 00	0 2091	63	5 43	0·0997	96	3 45	0·0654
31	11 37	0 2024	64	5 37	0·0981	97	3 43	0·0648
32	11 15	0·1960	65	5 32	0·0966	98	3 40	0·0641
33	10 55	0·1901	66	5 27	0·0952	99	3 38	0 0634
34	10 34	0·1843	67	5 22	0·0937	100	3 36	0·0628
35	10 17	0·1792	68	5 17	0·0922			

Helena, Montana Ter. GEORGE B. FOOTE, C. E.

Sailing Faster than the Wind.

To the Editor of the Scientific American:

If the ice boat question still debatable? Experienced raftsmen tell us that a log sent adrift outruns the stream that carries it, that a single log will outrun a raft of logs, which, in turn, outruns a raft of boards. If these are facts, they indicate the possibility of the ice boats outspeeding the wind. All streams of considerable length have points of slow and rapid flow. Assuming the mean rate to be one mile an hour, the rapids may have a four-mile rate and the slack water a half-mile rate. A log passing each rapid partakes of its speed, and the increased momentum causes it to outrun the more sluggish water below, and thus gain upon the mean rate of the current. A twenty-mile wind may have its thirty-mile gusts, and slack wind to correspond: and an ice boat, by the aid of the former, may gain upon the mean rate. On the other hand, aeronauts in a fifty-mile wind experience a perfect calm, that is, they move no faster nor slower than the wind. A balloon, like the ice boat, has momentum; but it moves without friction, and it is difficult to understand why it should be distanced by an ice boat if both are driven by the same wind.

Rochester, N. Y. E B. WHITMORE.

The Wisconsin Ten Thousand Dollar Reward.

To the Editor of the Scientific American:

I would like to answer, through the columns of your valuable paper, the numerous letters I am receiving from all parts of the country concerning the bounty of $10,000 offered by this State for a steam wagon that will fill certain requirements. To fill the bill, the machine must travel 200 miles north and south over very poor roads that are often sunk or worn down—in the wheel and horse tracks—six inches to a foot below the common level, but with a ridge in the center, the ridge being impassable for a horse: more so for the wheel of a steamer, when we take into account the stumps and stones, avoided by a double team and left in the center ridge. Our wagon track is about 4 feet 6 inches outside, and that must be the gage of a steamer, which machine should not weigh more than two tuns and must be so arranged that it will climb steep sand hills, cross poor bridges, run easily over bogs, stones, and grubs, and out of ruts, etc., just as a loaded lumber wagon does; and it must travel at the average rate of 5 miles per hour, and, in the language of the law, "be a cheap substitute for horses and other animals on the highway and farm."

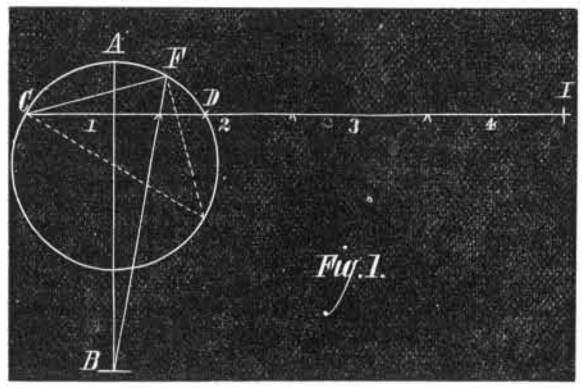
On the subject of amending the law so as to admit citizens of other States to compete for the prize, I can say that the law will never be so amended, neither should it be, of right. Rather let the public-spirited men of other States elect to their legislatures one or more mechanics and inventors, who are alive to the importance of the class of inventions and who have the courage and persistance to introduce and to fight a bill similar to ours through, as this was fought. It was the opinion of the originator of the law that no machine has yet been produced that will fill the bill, that inventors have failed to bring out a really practical machine; and it was for the especial purpose of encouraging inventors, to persevere until complete success was obtained, that the bounty was offered. G. M. MARSHALL.

Wisconsin Legislature, Assembly Chamber, Madison. February, 8, 1876.

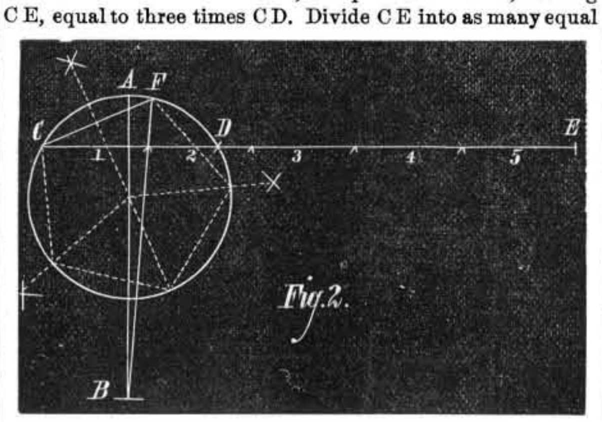
To Find the Side of a Polygon of any Number of Sides.

To the Editor of the Scientific American:

In the given circle draw a diameter, and produce it a distance equal to the radius, as A B, in each of the following

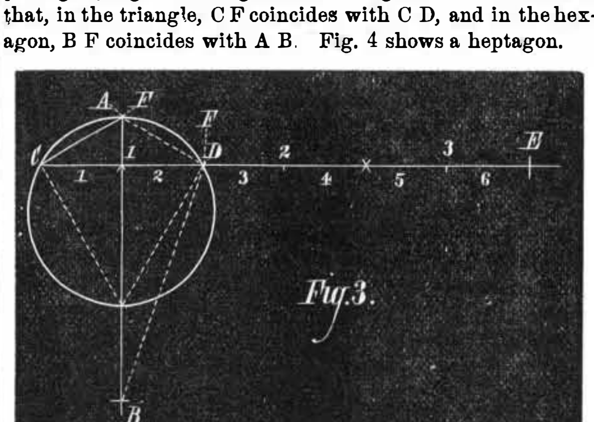


figures. With the same radius, on A as a center, cut the circle in C and D. Draw C D, and produce it to E, making C E, equal to three times C D. Divide C E into as many equal

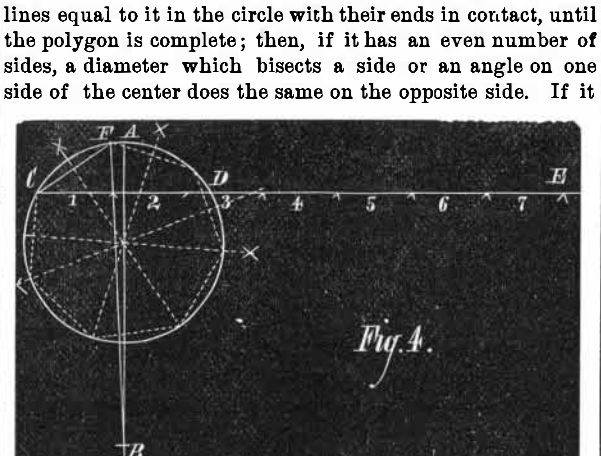


parts as the required polygon has sides. Draw B T, cutting C E, in the first point of section and touching the circle in F. Draw C F, which is the side required.

Fig. 1 shows the side of a square; Fig. 2 the side of a pentagon; Fig. 3 a triangle and a hexagon. It will be noted that, in the triangle, C F coincides with C D, and in the hexagon, B F coincides with A B. Fig. 4 shows a heptagon.



Demonstration:—When the side, C F, is found, place other lines equal to it in the circle with their ends in contact, until the polygon is complete; then, if it has an even number of sides, a diameter which bisects a side or an angle on one side of the center does the same on the opposite side. If it



has an odd number of sides, a diameter which bisects a side on one side of the center bisects an angle on the opposite side; thus proving that the sides are regular, and consequently equal. ALBERT BONDELI.

Philadelphia, Mo

The Azoic Period and the Glacial Epoch.

To the Editor of the Scientific American:

In one of his lectures on glaciers, Agassiz said: "If it can be demonstrated that such was the condition of our earth (covered with glaciers), it will follow that the doctrine of transmutation of species and of the descent of animals that live now from those of past days is cut at the root by this winter, which put an end to all living beings on the surface of the globe." Now as glacial action is everywhere visible on the surface of the globe as it now is, it is evident that the glacial period was after the earth had assumed its present form. But if the glacial epoch was before the appearance of animal life upon the earth, then it must have been during the azoic age or before it; and there can be no evidence of a universal glacial epoch in these formations succeeding the azoic, since they would all be covered up by the subsequent formations.

There seems to be a slight confusion here; can any one throw any light on this subject?

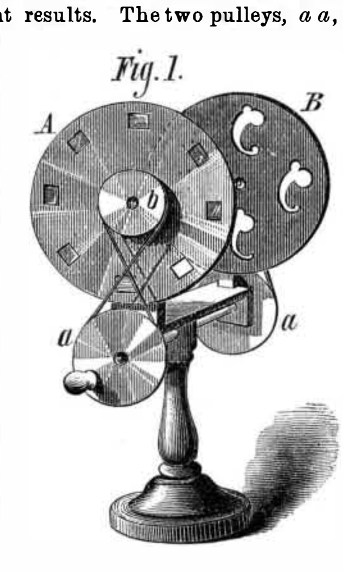
Franklin, N. Y. P.

[For the Scientific American.]

THE CHROMOSTROBOSCOPE.

BY PROFESSOR A. RICCO, OF MODENA, ITALY.

The following simple device, which I have invented, is productive of very brilliant results. The two pulleys, *a a*, are made to turn together by means of the crank, and communicate their motion by means of endless cords to the wheels, *b*, to which are attached two disks of cardboard, A, B. In the anterior disk are eight holes, containing little glass windows of different colors. The disk, B, has a white design on black ground. The best way to make the design is to cut it out of the black cardboard and to place oiled white tracing paper behind the latter. On keeping the eye at a point which the apertures successively pass, and looking at the design through them, a

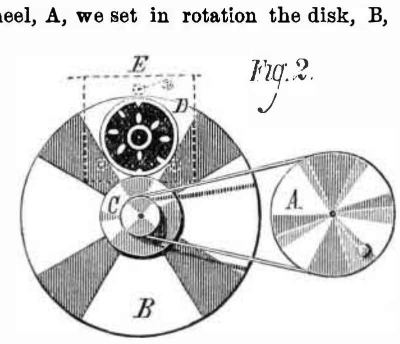


colored image will be produced by each one as it passes, and this image will remain on the retina, by persistence of vision, long enough to make the design appear multiplied symmetrically about the center with great brilliancy of colors. If now the figures, of which the design consists, are made to change successively in form and position, as in Plateau's phenakistoscope, the surprising effects of the graceful motions of the images in that apparatus will be combined with a splendid coloration.

Even by simply putting colored glasses in the apertures of the phenakistoscope, and using white designs on a black ground, similar results are obtained; they are less brilliant, however, because, as is well known, the design in that instrument is placed on the perforated disk itself, and we look through the latter at the reflection of the design in a mirror in front of the apparatus. Of course light is lost by the reflection.

If it is desired to project the images of the chromostroboscope on a screen, the arrangement represented in Fig. 2 may be employed.

By turning the wheel, A, we set in rotation the disk, B, which contains sectors of colored glass. Together with this disk, the wheel, C, turns, on the circumference of which rests a disk, D, which may be either perforated or painted black on colorless glass. The wheel, C, and the disk, D, turn together by friction gearing. The pulley, E, which, together with two others, keeps the disk in place, is movable so that the disk can be taken out and replaced by another, like the slides of a magic lantern, while the other parts of the apparatus may remain in undisturbed connection with the lantern.



Modena, January, 1876.

[Evidently this apparatus has a certain analogy to the new chromatrope of Professor Morton, described on page 344, volume XXXIII, of the SCIENTIFIC AMERICAN.—EDS.]

SINGULAR ELECTRICAL EXPERIMENTS.

BY PROFESSOR A. RICCO, OF MODENA, ITALY.

In studying the effects of electricity, it is interesting to note the curves or trajectories passed over by particles of electrified powders. In order to observe them conveniently, they may be illuminated by a ray of sunlight. On putting a little lycopodium or other powder on an insulated conductor, A (Fig. 1), and charging the latter, a jet will be produced which will diffuse a little of the powder in the air; after some time, when the jet has ceased and a non-insulated conductor, B (Fig. 2), is brought near, the jet is reproduced, and