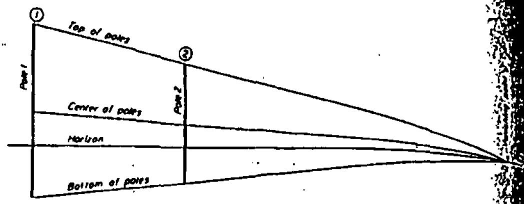
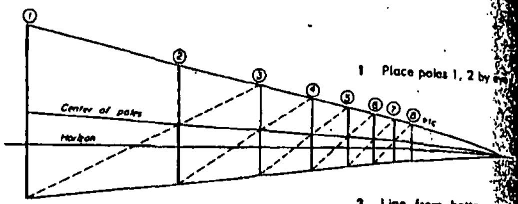
There's No Trick to Spacing Poles In Perspective

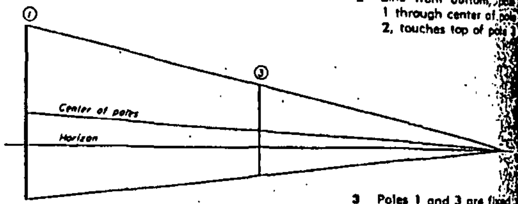
When you use this logical, step-by-step method that one practical engineer suggests



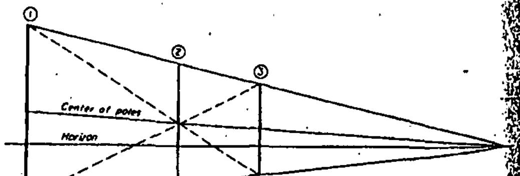
1 Place poles 1, 2 by



2 Line from bottom, pole 1 through center of pole 2, touches top of pole 3



3 Poles 1 and 3 are fixed



4 Lines cross at pole 2

► WE ARE INDEBTED to T C Rathbone, chief engineer of machinery division of Fidelity & Casualty Co of New York, *for a logical method of locating a row* of equally spaced poles (or equivalent) in perspective. It all started when Rathbone checked our spacing of the poles we sketched in POWER, Sept 1952, p 156. *He wrote in to point out a slight* spacing error in our sketch.

While his correction in no way affects the facts we presented regarding cabinet projection, we do feel that some readers will be interested in knowing how to space poles, or other objects, correctly in perspective. Here's how, in our own words:

Suppose, Fig. 1, you place poles 1 and 2 by eye to suit yourself. Draw lines (all converging to the vanishing point) locating the tops, bottoms, and centers of poles.

Next, Fig. 2, *draw a line from the* bottom of pole 1 through the center of pole 2. Pole 3 must fall where this line cuts the line of pole tops. In the same way, a line drawn from the bottom of pole 2, through center of pole 3, locates the top of pole 4, and so on, as pictured in Fig. 2.

Now let's take another case. Here the problem is to locate pole 2, where poles 1 and 3 are fixed, Fig. 3. If the poles are equally spaced on the ground, pole 2 must lie at the intersection of two wires, one stretched from the top of 1 *to the bottom of 3, and the other from* the bottom of 1 to the top of 3. That locates pole 2, as shown in Fig. 4.

The same methods can be used in perspective sketches of any objects lying in a straight line and equally spaced.

Hydraulic Conversion Factors for Special Pipes

To obtain velocity, velocity head or friction loss for pipes listed below, take for Schedule 40 pipe (C = 100) and multiply by factor in this table

Type of pipe	Hydraulic property	Nominal pipe size—inches ½	¾	1	1¼	1½	2	2½	3	4	5	6
Schedule 10 steel C=100	Vel	.853	.872	.916	.916	.919	.922	.881	.883	.892	.906	.910
	Vel head	.728	.754	.836	.840	.841	.842	.773	.783	.799	.826	.828
	Friction	.677	.711	.804	.808	.810	.813	.731	.746	.760	.790	.795
	Pipe ID	.674	.884	1.097	1.442	1.682	2.157	2.635	3.260	4.260	5.295	6.357
Rubber-lined Sch 40 steel C=140*	Vel	—	—	1.72	1.49	1.41	1.30	1.24	1.19	1.14	1.17	1.14
	Vel head	—	—	2.97	2.23	1.97	1.67	1.54	1.40	1.29	1.36	1.29
	Friction	—	—	2.02	1.42	1.22	1.01	.907	.814	.734	.782	.733
	Pipe ID	—	—	.799	1.130	1.360	1.817	2.219	2.818	3.776	4.672	5.690
Saran lined Sch 40 steel C=140	Vel	—	—	2.33	1.68	1.44	1.50	1.31	1.24	1.23	—	1.23
	Vel-head	—	—	5.43	2.85	2.06	2.25	1.72	1.55	1.52	—	1.51
	Friction	—	—	4.21	1.91	1.29	1.44	1.04	.916	.894	—	.889
	Pipe ID	—	—	.687	1.0625	1.344	1.687	2.156	2.750	3.625	—	5.469
Uscolite (U.S. Rubber Co) C=140	Vel	1.29	1.23	1.20	1.17	1.15	1.13	—	—	—	—	—
	Vel head	1.69	1.52	1.44	1.36	1.33	1.29	—	—	—	—	—
	Friction	1.01	.895	.842	.779	.759	.733	—	—	—	—	—
	Pipe ID	.55	.742	.96	1.278	1.50	1.94	—	—	—	—	—
Saran & Pesten (Amer Hard Rubber Co) C=140	Vel	1.29	1.23	1.20	1.17	1.15	1.13	1.18	1.16	1.15	—	—
	Vel head	1.69	1.52	1.44	1.36	1.33	1.29	1.38	1.36	1.33	—	—
	Friction	1.01	.895	.842	.779	.759	.733	.800	.781	.758	—	—
	Pipe ID	.546	.742	.957	1.278	1.500	1.939	2.277	2.842	3.749	—	—
Hard Rubber (Amer Hard Rubber Co) C=140	Vel	1.54	1.44	1.25	1.22	1.26	1.22	1.20	1.24	1.15	1.12	1.16
	Vel head	2.40	2.07	1.57	1.49	1.58	1.47	1.45	1.55	1.33	1.27	1.35
	Friction	1.55	1.30	.932	.870	.933	.863	.847	.916	.758	.721	.776
	Pipe ID	.500	.687	.937	1.250	1.437	1.875	2.250	2.750	3.750	4.750	5.625

* ⅛-in. linings for 4 in. and under; 3/16-in. linings for 5 and 6 in.

► THIS TABLE is based on the following relations: (1) velocity is inversely proportional to the area or pipe diameter squared (2) velocity head is proportional to velocity squared, or inversely proportional to the pipe diameter to the fourth power (3) friction loss is inversely proportional to the roughness coefficient C to the 1.85 power and pipe diameter to the 4.87 power (Williams and Hazen formula). C is usually taken as 100 in designing steel and cast-iron pipes. Most tables are based on this value for piping calculations.

Inside diameters listed in the table are those currently used by manufacturers, such as American Hard Rubber Co and the United States Rubber Co. The roughness coefficients are those usually assumed for the particular material in question. *Blank spaces indicate* sizes in which a complete line of pipes and fittings is not currently being manufactured.

Although the materials listed are in wide use at present, these factors apply to any pipe having the same inside diameter and roughness coefficient.

Problem: Find the friction loss through 350 ft of 1½-in. Saran-lined steel pipe carrying 30 gpm of water.

Solution: From *Cameron Hydraulic Data* or *Permutit Data Book*, or other table, loss per 100 ft of 1½-in. Schedule 40 pipe, C-100, is 11.1 ft. From table above, correction factor is 1.29. Then:

$$\text{Friction loss} = \frac{350}{100} \times 11.1 \times 1.29 = 50.1 \text{ ft}$$

BY STANLEY LENOX *The Permutit Co*