indicated by the arrows, because of the resistance which the bullet offers to them. We will designate a velocity vertical to the longitudinal bore-axis as the transverse or cross velocity, and one in the direction MNP of the bore-axis (Fig. 11) as the longitudinal velocity. As soon as the bullet is away from the muzzle, the gas particles flow freely into the air. Since the gas pressure thereupon falls, and at first little energy has been lost by friction etc., then the velocity of the gas particles increases until, as a consequence of the energy loss becoming stronger partly because of friction on the surrounding air particles and partly because of doing work of compression, it gradually decreases. This work of compression, which requires the greater part of the energy, is used up if the flowing powder gases compress the air in front of them. This occurs until the gas pressure produced by the existing elastic air compression prevents a further acceleration of the air particles. The air is therefore dammed up at the place CPC_1 (the so-called Stodola compression-shock), and this dam or piling-up lies farther from the muzzle in the case of high pressure than for low pressure. As a result of this the dam always moves back towards the muzzle with gradually decreasing pressure, and finally apparently disappears in it. The migration velocity of the dam is therefore a direct measure of the pressure variation in the muzzle. The series of photographs of Fig. 13 shows this phenomenon for the time interval during which the bullet had moved from the muzzle out a distance of 3 m. The numbers indicated in the individual pictures denote the distance of the triggering spark F_2 (Fig. 3) from the muzzle in decimeters. In all of the photographs it may also be noticed that the image of the compression line is shadowed dark toward the muzzle, and bright away from it. Accordingly, the density or congestion of air is greater on the side of the compression line facing the muzzle. The increase in pressure is steeper here, and outside gradually decreases. It is perhaps useful to draw an analogy for the explanation of the compression line CPC_1, which is observed in the case of flowing water[1].

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1) Our attention was brought to this analogy by Baurat Beyerhaus (Versuchaustalt für Schiffs und Wasserbau in Charlottenburg).