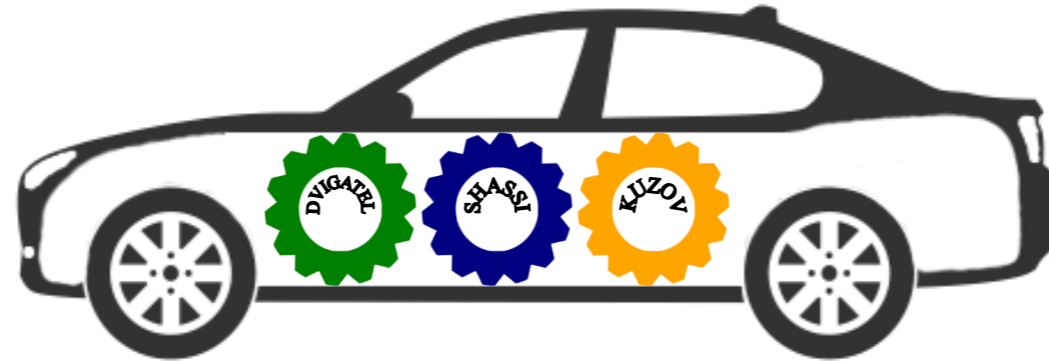


# VEHICLES CONSTRUCTION

## AVTOMOBILLAR KONSTRUKSIYASI



**7-8<sup>th</sup> Topic: Fuel System.**

**(7-8-Mavzu: Ta'minlash tizimi)**

**Part 3**

**Associate Professor: Yusupov Sarvarbek**

## 7-8-Mavzu: Ta'minlash tizimi

(7-8<sup>th</sup> Topic: Fuel System.)

### O'quv rejasi:

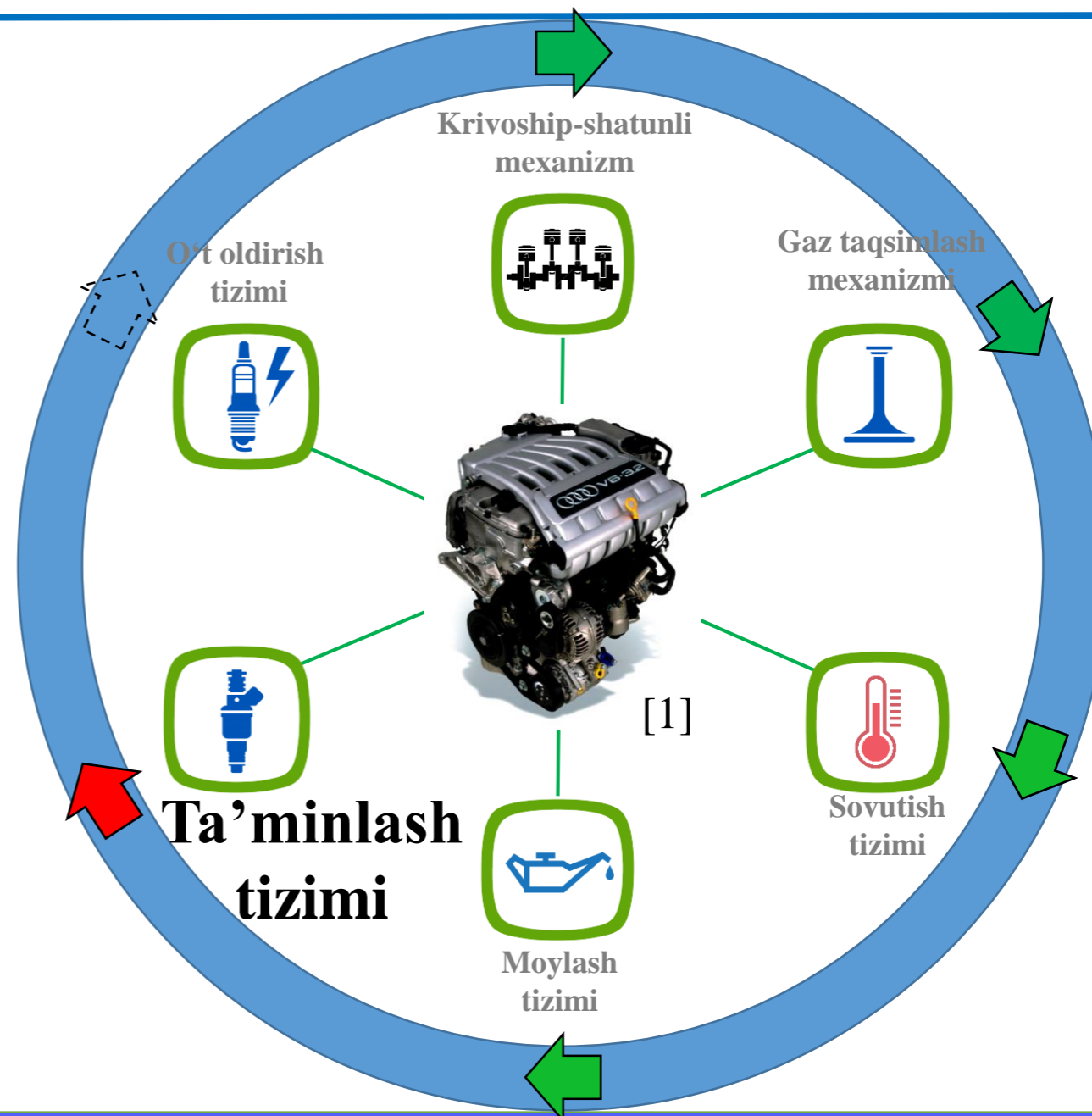
**7.5. Gaz bilan ishlaydigan dvigatellarning ta'minlash tizimi.**

**7.6. Gaz bilan ta'minlash tizimi qismlarining konstruksiyasi va ishlashi.**

7.7. Injektorli dvigatellarning zamonaviy yonilg'i purkash tizimi.

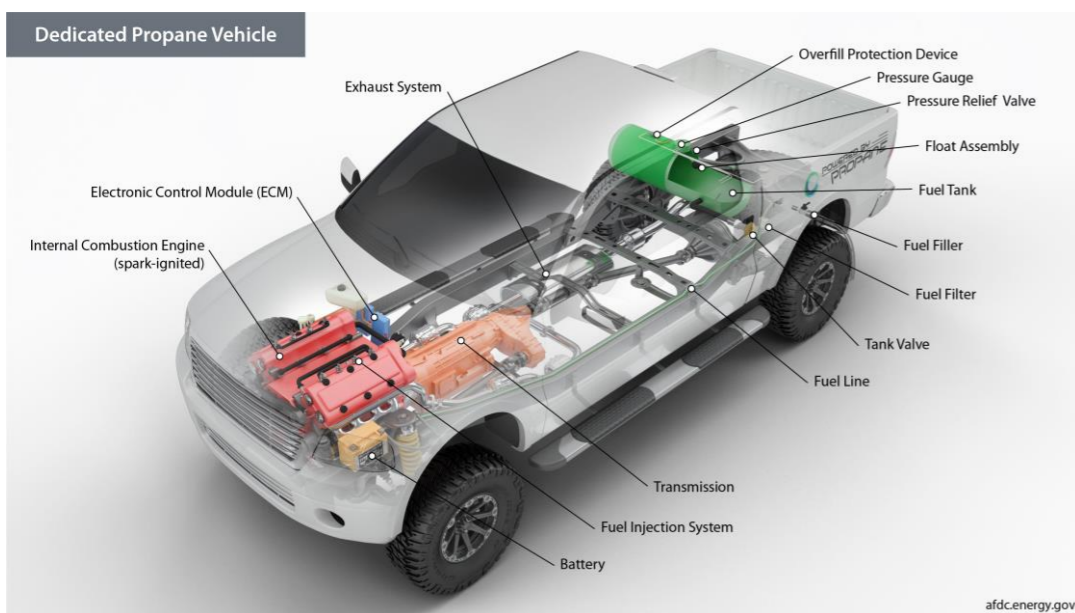
7.8. Injektorli yonilg'i purkash tizimi qismlarining konstruksiyasi va ishlashi.

- Karbyuratorli dvigatel;
- Dizel dvigatel;
- **Gazli dvigatel;**
- Injektorli dvigatel.

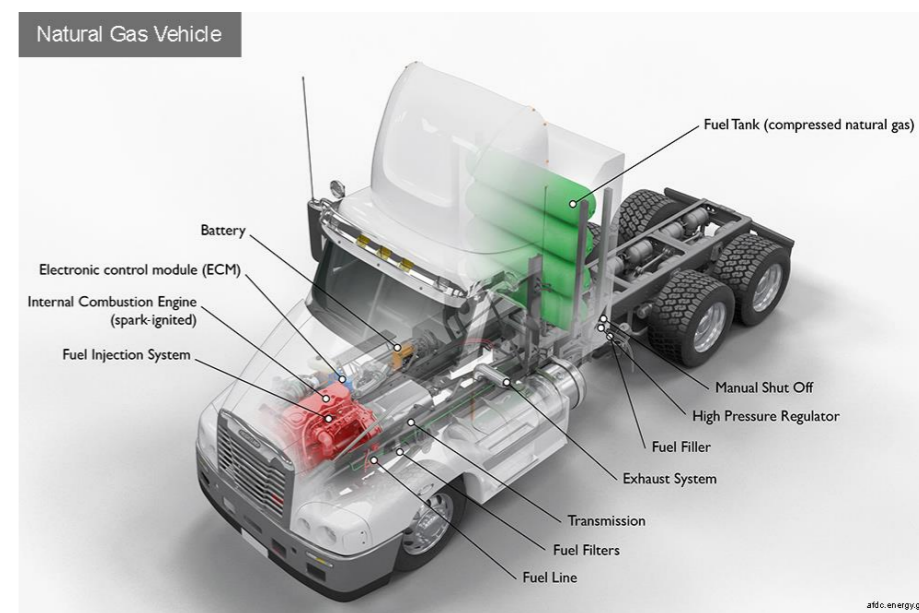


## 7.5. Gaz bilan ishlaydigan dvigatellarning ta'minlash tizimi.

Gaz bilan ishlaydigan dvigatellar zamonaviy shahar transport vositalarida keng qo'llanilmoqda.



[70]



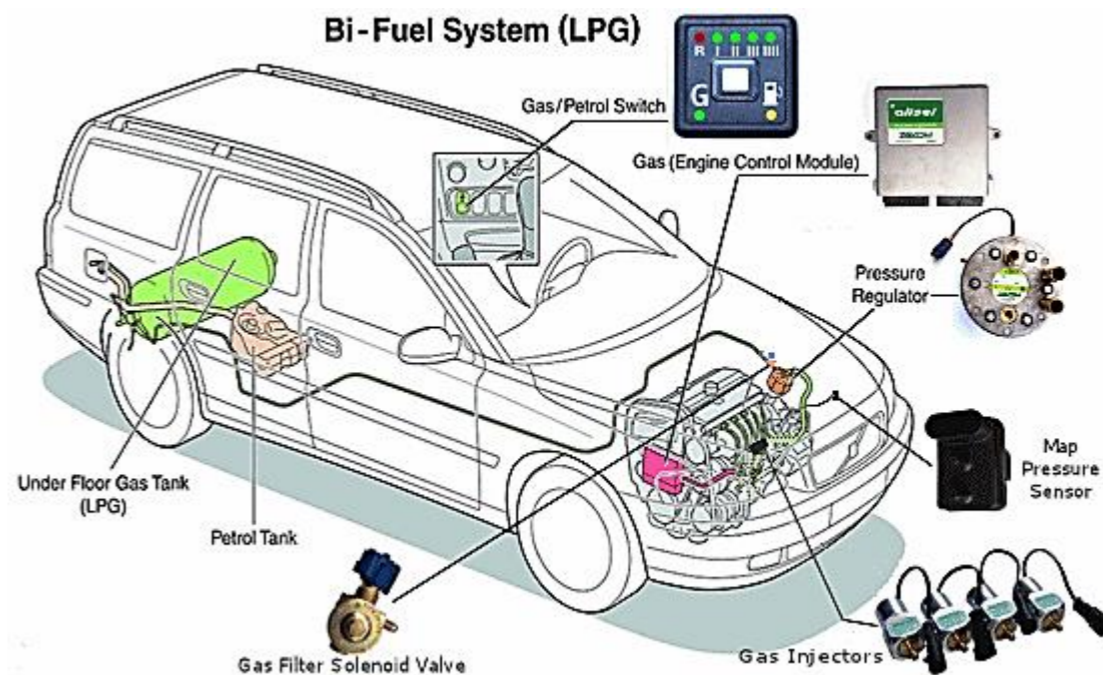
[71]



[72]

Bunda **siqilgan** yoki **suyultirilgan** holatdagi tabiiy, sanoat va sintetik gazlardan foydalaniladi.

**Siqilgan** va **suyultirilgan** gazlar maxsus ballonlarda saqlanadi, shuning uchun ham transport vositalari gaz ballonli deyiladi.



[73]

Odatda, **gaz bilan ishlaydigan dvigatellar** suyuq yonilg'ida ishlaydigan dvigatellar bazasida yaratiladi.

**Bunda** dvigatelning gaz bilan ishlashga o'tkazish uchun uning asosiy qism va uzellari o'zgarmagan holda qoladi.

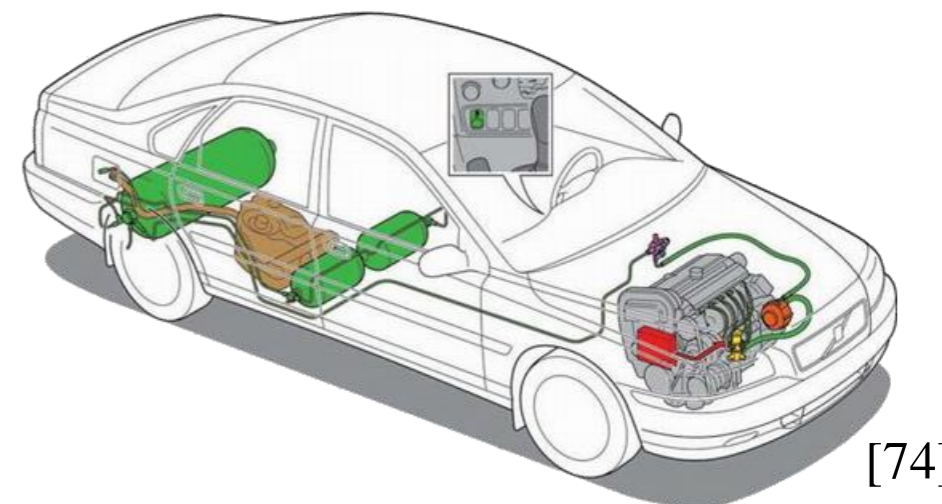
**Gaz bilan ishlaydigan modifikasiyasining asosiy farqi:**

- yonilg'i uzatish tizimi;
- yonuvchi aralashmaning alangalanishi;
- tartibga solinishi hisoblanadi.

# Karbyuratorli dvigatellarni gazsimon yonilg'iga o'tkazish

ikki usulda amalga oshiriladi.

➤ Birinchi usulda standart karbyurator dvigatelini gazballon qurilmalar bilan jihozlab, uning gaz modifikatsiyasini yaratish.



Bu holda dvigatelning ham **benzinda**, ham **gazda** ishlash imkoniyati saqlanib qolinadi.

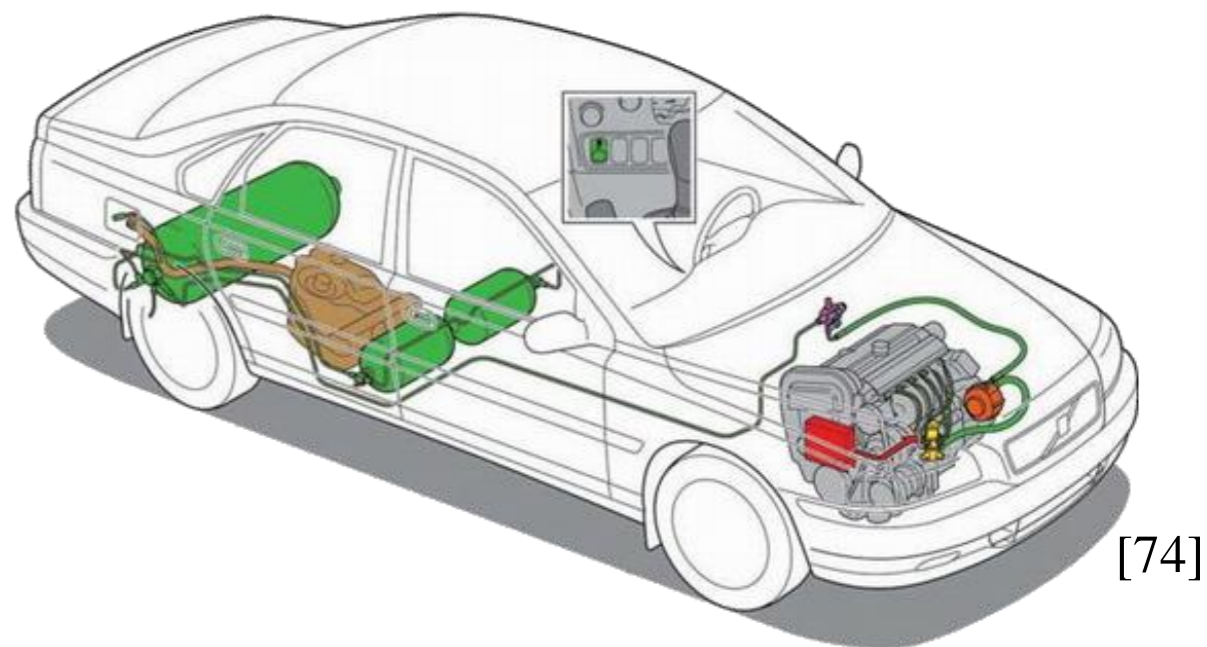
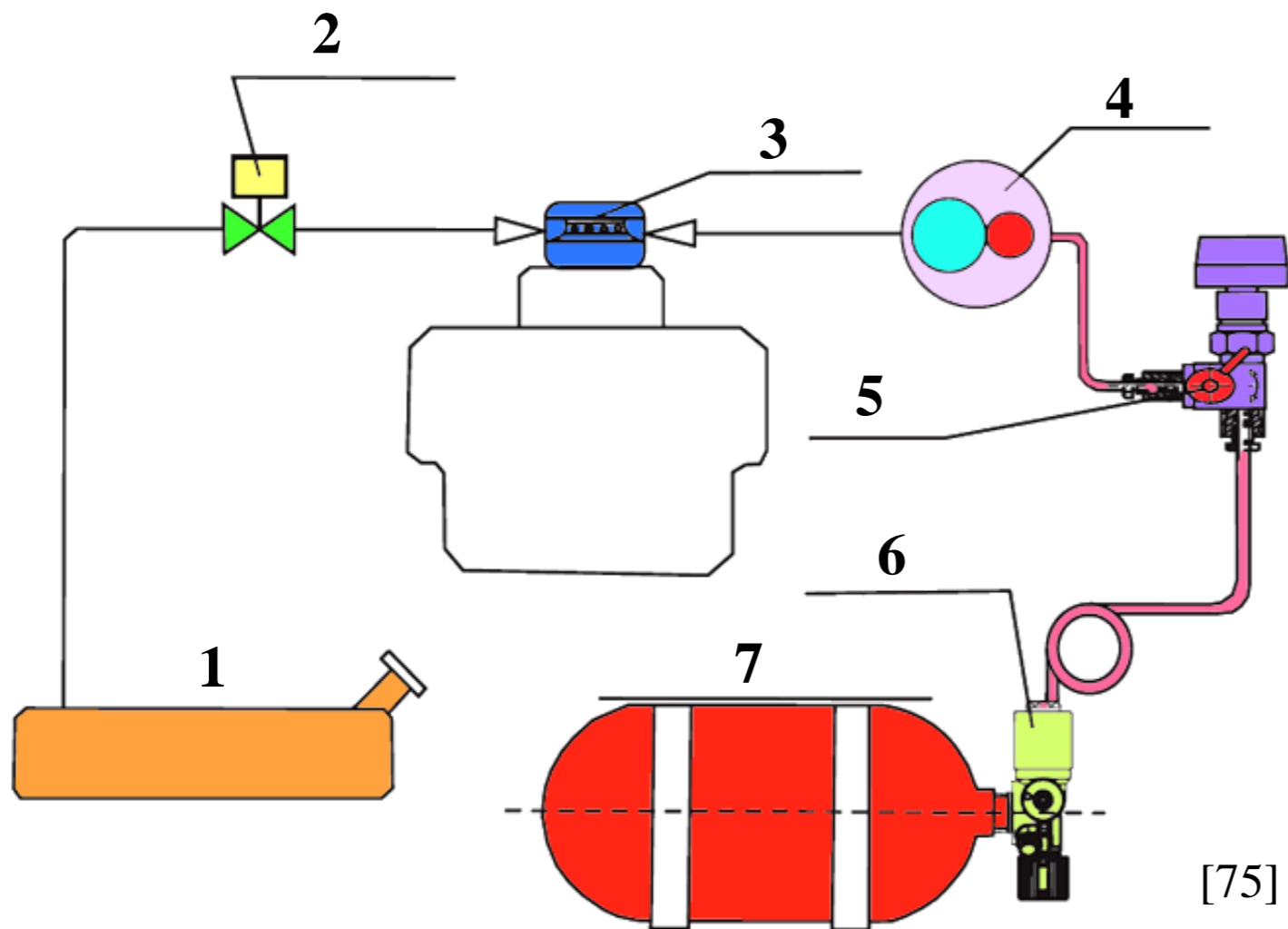
Shu bilan birga, **benzinda** dvigatel to'la quvvatga erishsa, **gazda** esa quvvat biroz pasayadi.

$$N_{Ben} = N_{max}$$

$$N_{Gaz} = N_{max} - G$$

**10-20 % kam**

# Gaz balloni o‘rnatilgan avtomobilning konstruktiv sxemasi.



[74]

[75]

1-yonilg‘i baki, 2-benzin kanalini ochib-yopuvchi elektrokapan, 3-karbyurator, 4-metan gazi uhun reduktor, 5-gaz bilan to‘ldirish klapani, 6-elektrokapan, 7-metan gaz balloni.

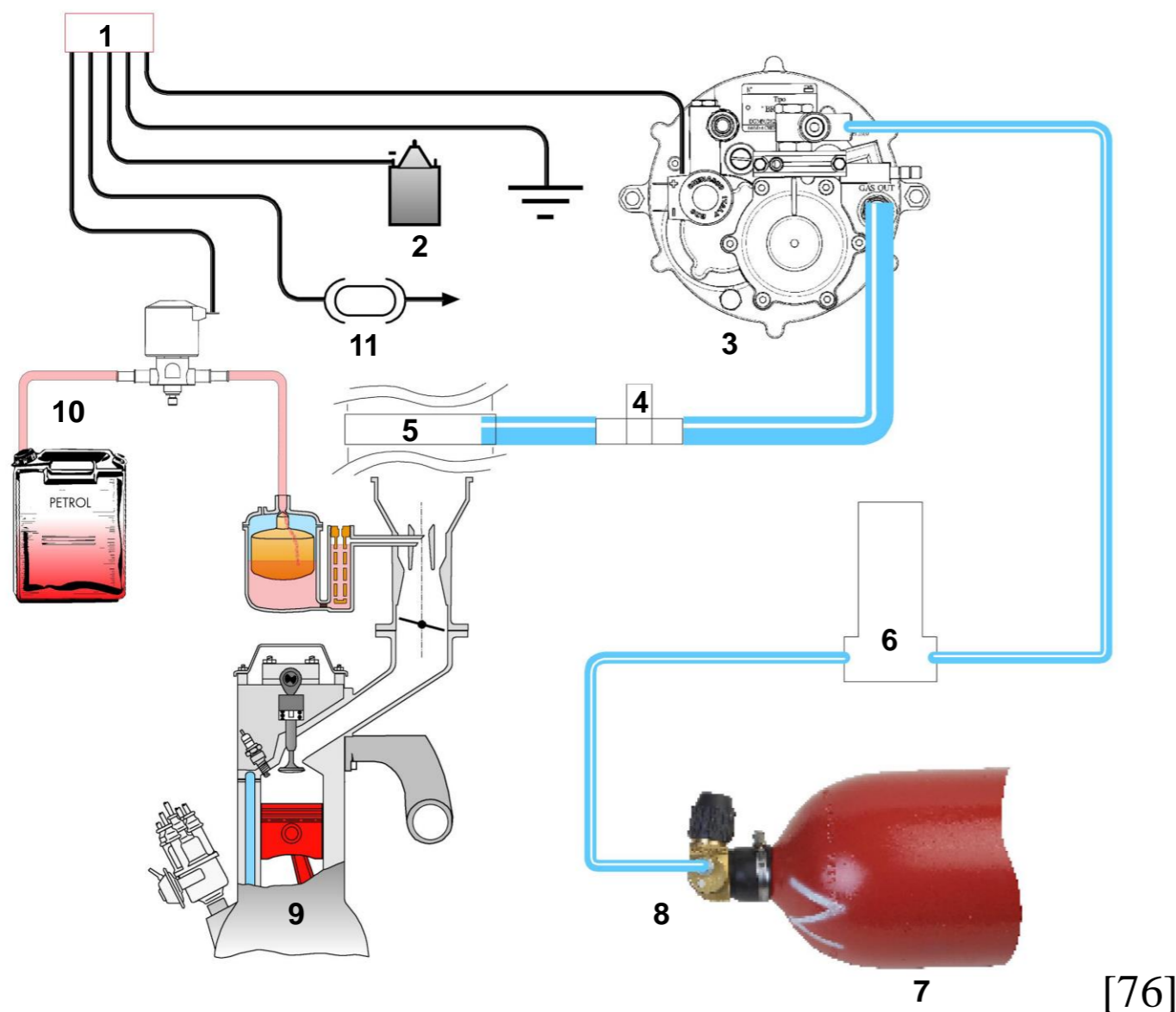
➤ **Ikkinchi usulda karbyurator dvigateldan gazsimon yonilg'ida to'la quvvatga erishuvchi maxsus gaz dvigateli yaratiladi.**

**Bunday dvigatellar:**

➤ **siqish darajasining yuqorilatganligi;**

➤ **gaz aralashtirgich o'rnatilishi tufayli samaradorlik ko'rsatkichlari ancha yaxshilanadi.**

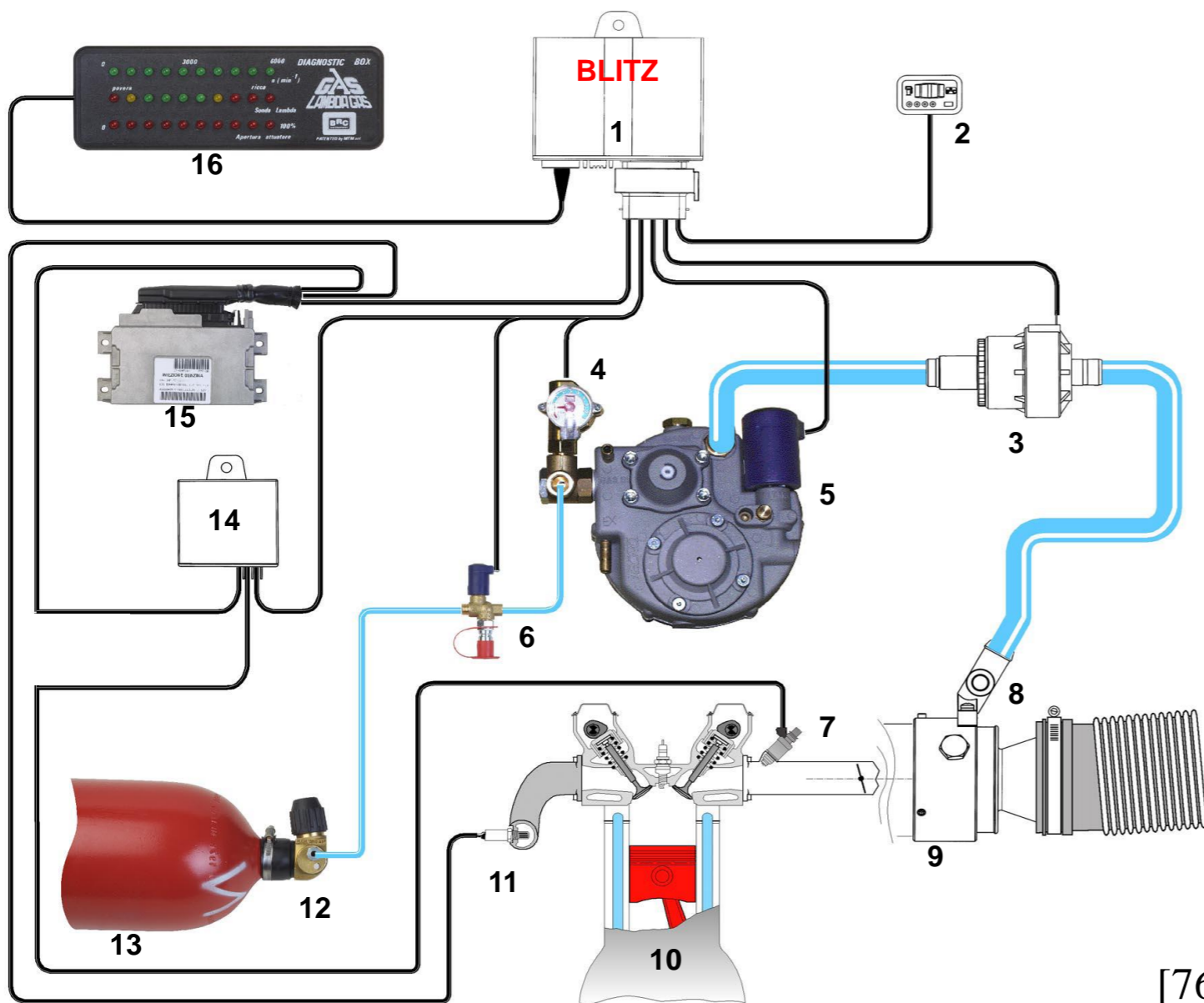
# Karbyuratorli avtomobilda metan jihozining elementlari:



1-markaziy jihozlar, 2-o‘t oldirish g‘altagi,  
 3-reduktor, 4-rostlagich,  
 5-aralashtirgich, 6-metan klapani  
 “VMA3/E”, 7-ballon, 8-klapan “VB A1”,  
 9-dvigatel, 10-benzinli elektroklapan,  
 11-saqlagich.

[76]

# BLITZ tizimining umumiy nazorat qilish sxemasi.

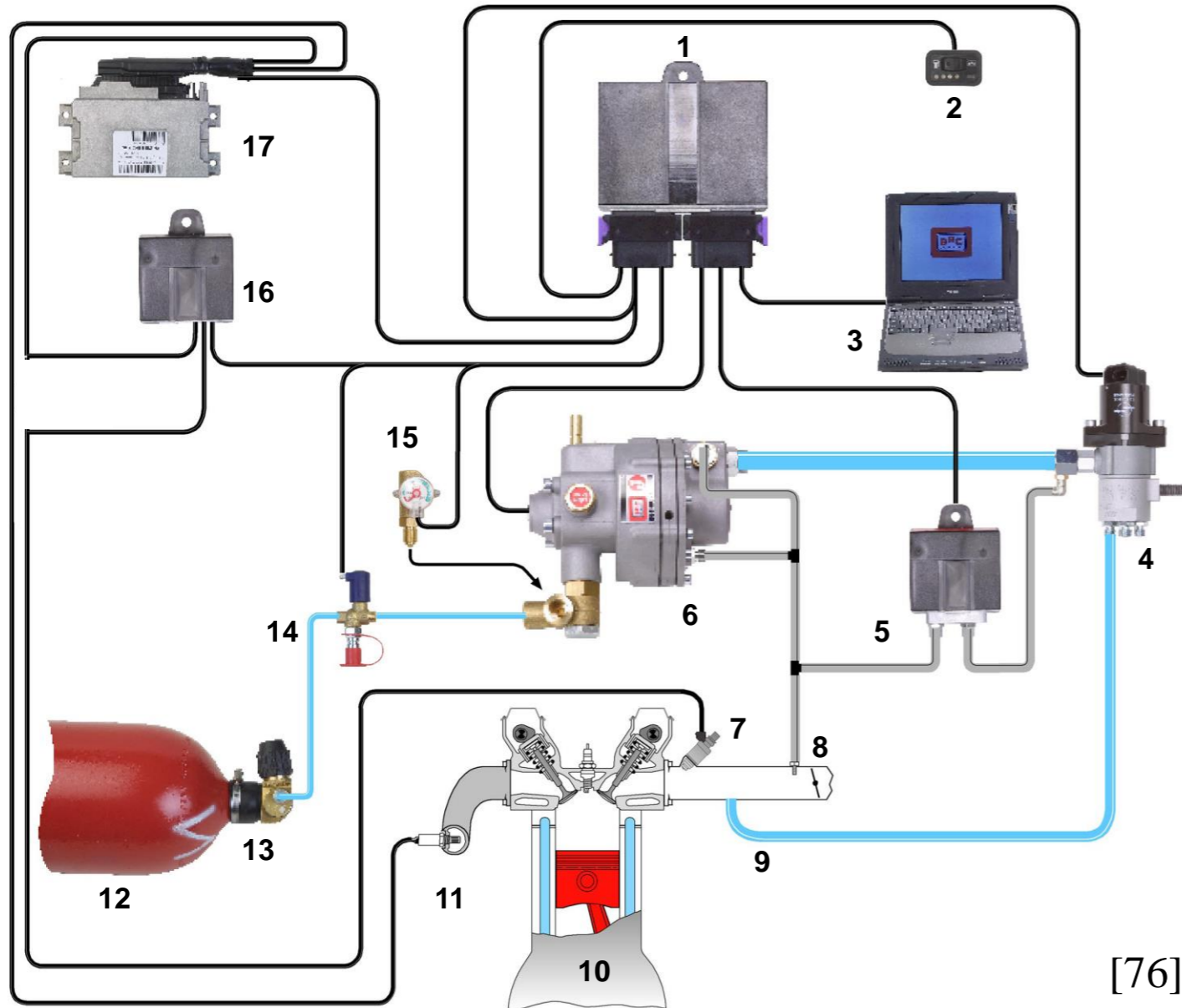


[76]

1-BLITZ tizimining EBB, 2- almashlab-  
 ulagich, 3-λ gaz aktuatori, 4-metanli  
 manometr, 5-reduktor “TecnoM”,  
 6-toʻldirish klapani “VM A3”, 7-benzin  
 injektor, 8-klapan, 9-aralashtirgich,  
 10-dvigatel, 11- λ zond, 12- “VB A1” klapani,  
 13-metanli ballon, 14-Hi MM moduli,  
 15-markaziy benzin purkash tizimining EBB,  
 16-diagnozlash qutisi.



# JUST HEAVY tizimining umumiy nazorat qilish sxemasi.

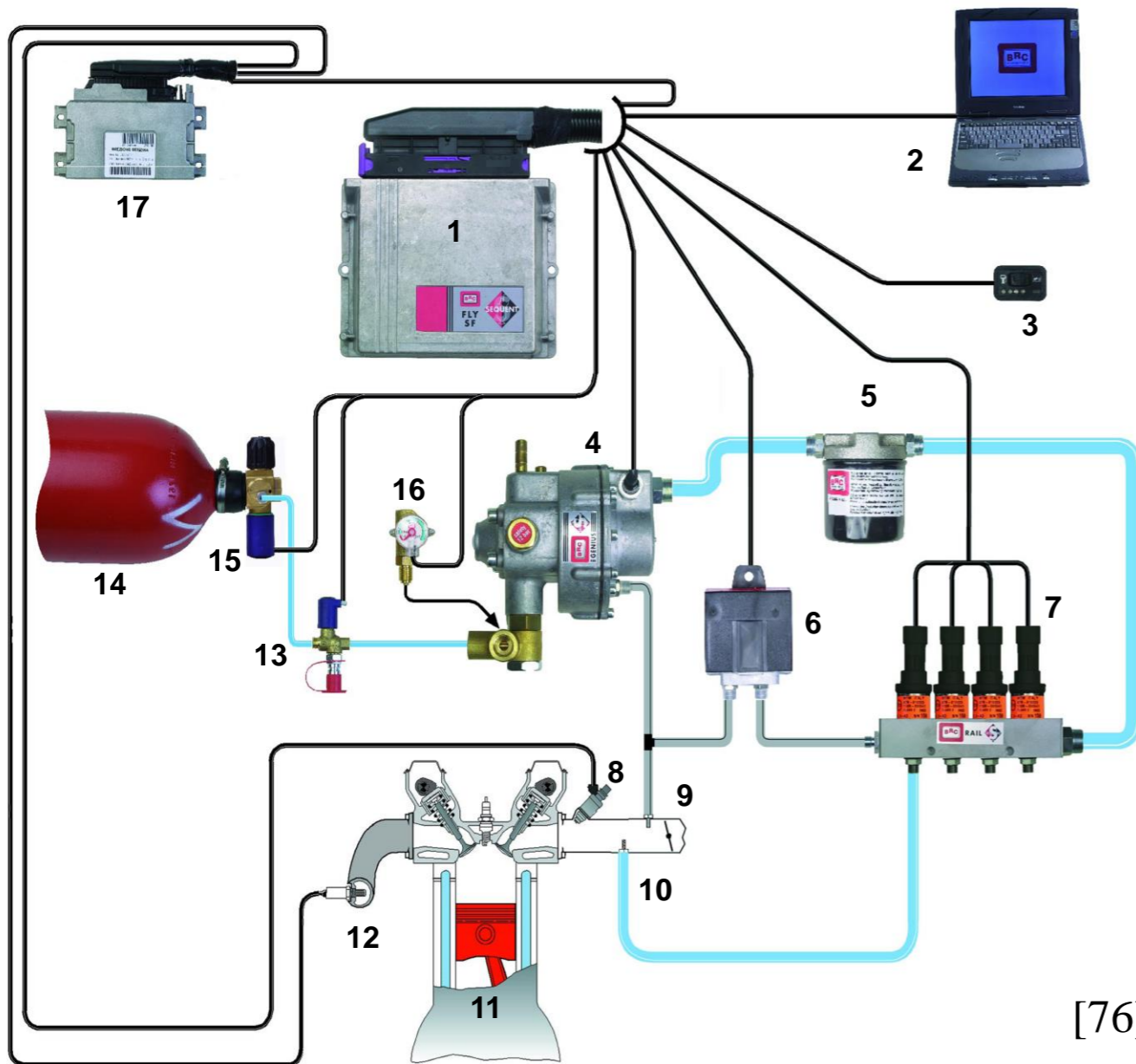


1-JUST HEAVY tizimining EBB, 2-almashlab-  
 ulagich, 3-diagnostika kompyuteri, 4-“Step HS”  
 aktuatori, 5-P1-MAP datchigi, 6-reduktor “Genius  
 HSM”, 7-benzin injektori, 8-bosimni pasayichini  
 aniqlovchi MAP, 9-taqsimlangan gaz,  
 10-dvigatel, 11- $\lambda$  zond, 12-metanli ballon, 13-“VB  
 A1” klapani, 14-to‘ldirish klapani “VM A3”,  
 15-metanli manometr, 16-Hi MM moduli,  
 17-markaziy benzin purkash tizimining EBB.

[76]



# SEQUENT tizimining umumiy nazorat qilish sxemasi.



[76]

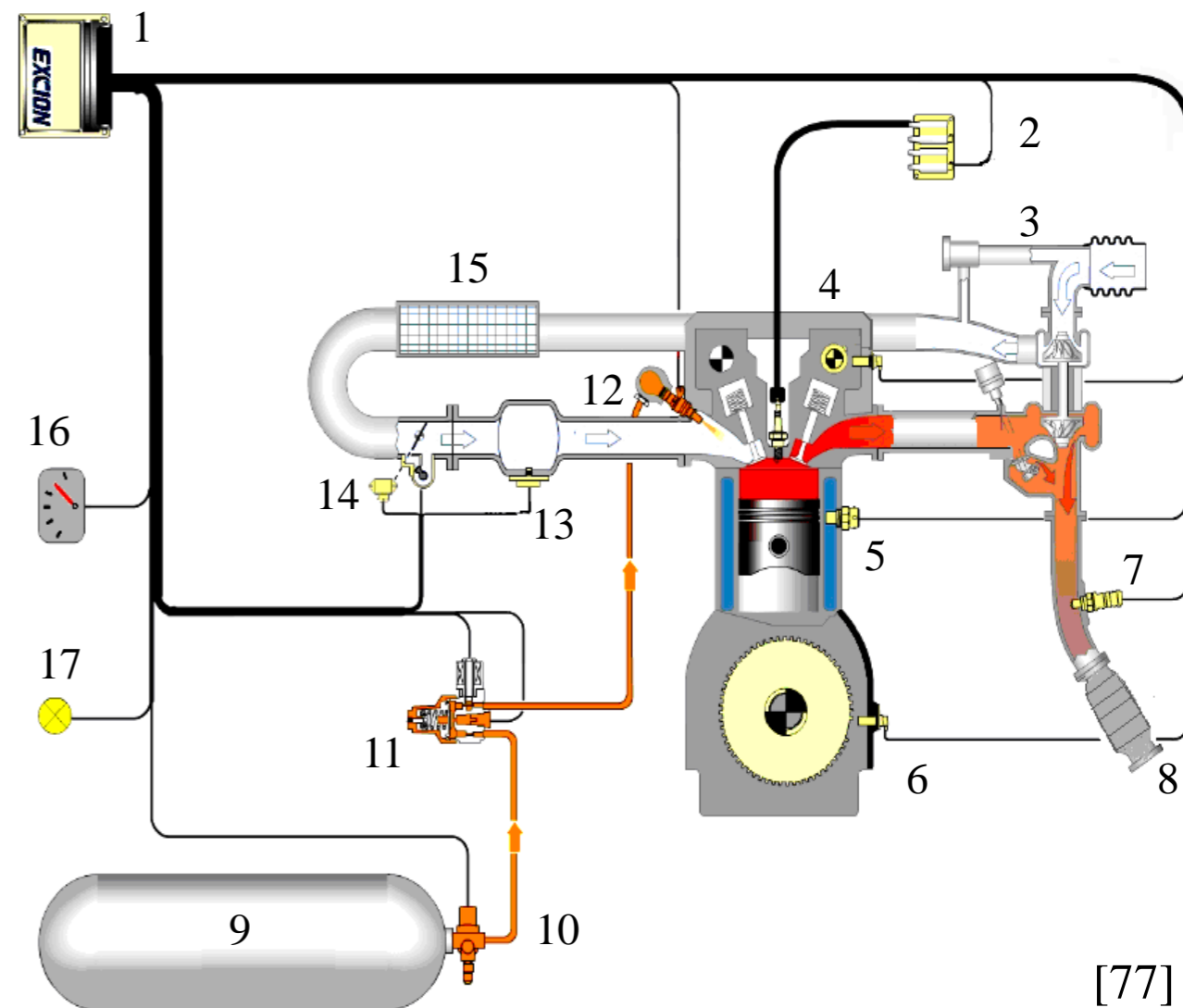
1-SEQUENT tizimining EBB, 2-diagnostika kompyuteri, 3-almashlab-ulagich, 4- reduktor “Genius HSM”, 5-filtr “FJ1”, 6-P1-MAP datchigi, 7-BRC injektorlari, injektorlar rampasi bilan, 8-benzin injektor, 9-bosimni pasayichini aniqlovchi MAP, 10-taqsimlangan gaz, 11-dvigatel, 12- $\lambda$  zond, 13-to‘ldirish klapani “VM A3”, 14-metanli ballon, 15-“VB A1” klapani, 16-metanli manometr, 17-markaziy benzin purkash tizimining EBB.

## Dizel dvigatellarini gazsimon yonilg'iga o'tkazish usullari:

➤ **Birinchi usul — dizelni uchqun bilan alanganadigan gaz dvigateliga qayta jihozlash.**

Buning uchun silindrlardagi siqish darajasi 8-9 gacha kamaytirilib, o't oldirish tizimi va gazballon qurilmalari o'rnatiladi.

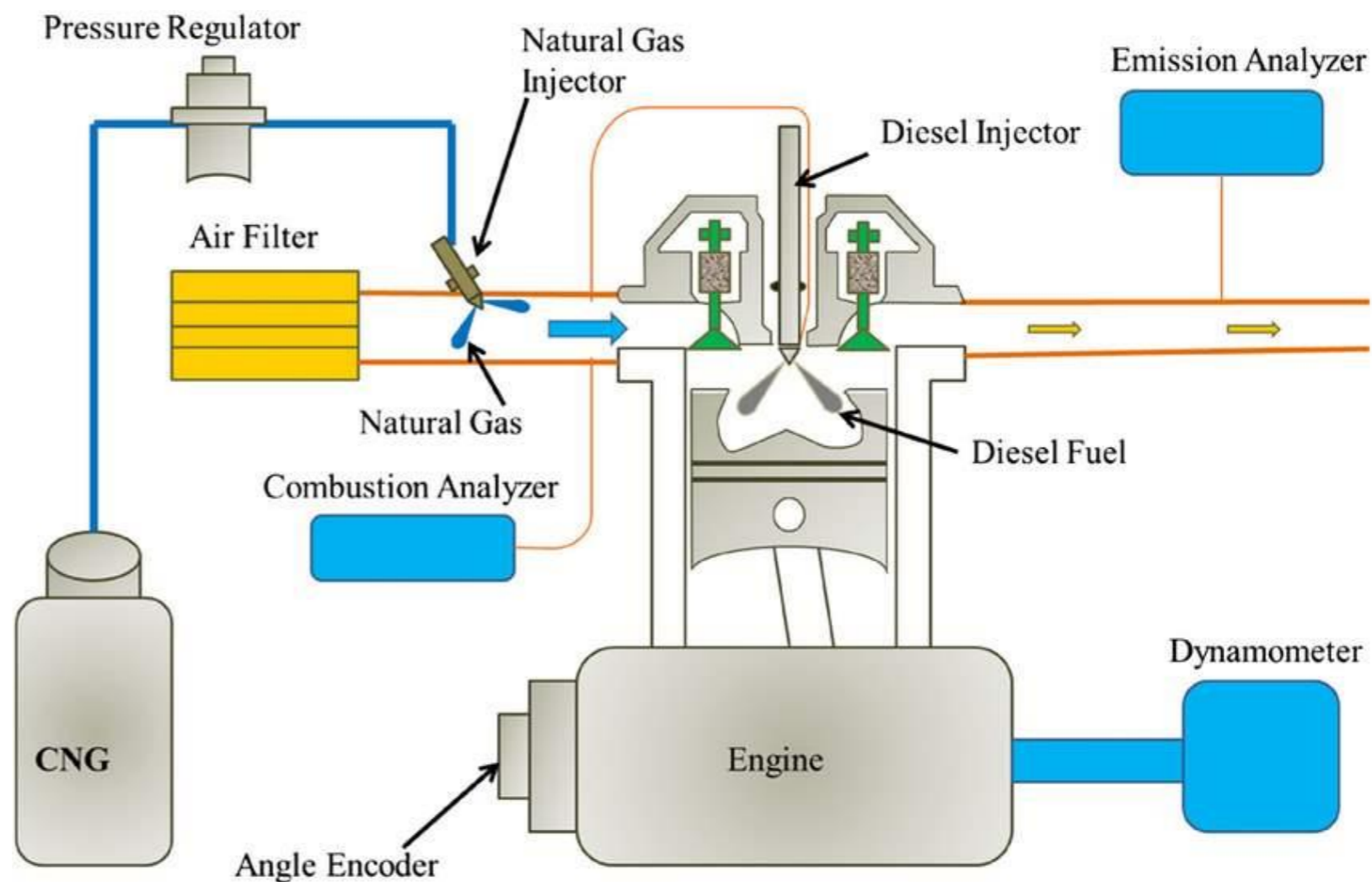
1-EBB, 2-o't oldirish g'altagi, 3-qo'shimcha havo kiritish klapani, 4-GTMning holati datchigi, 5-sovutish tizimining harorat datchigi, 6-tirsakli valning aylanishlar sonini aniqlovchi datchik, 7-kislorod datchigi ( $\lambda$ -zond), 8-katalitik konvertor, 9-gaz ballon, 10-yuqori bosim klapani, 11-past bosim klapani, 12-metan gazli injektor, 13-havo bosimi datchigi (MAP), 14-drossel zaslonkasi (potentsiometr), 15-havoni sovituvchi radiator (Interkuler), 16-metan gazi o'lchagichi, 17-nosozlikni ko'rsatuvchi chiroq.



[77]

➤ **Ikkinchi usul - dvigatelning ayni bir vaqtda dizel yonilg'isi va gaz bilan ishlashini ko'zda tutadi.**

Gazsimon yonilg'ini uzatish uchun dvigatel gaz ballon qurilmasi bilan jihozlanadi.



[78]

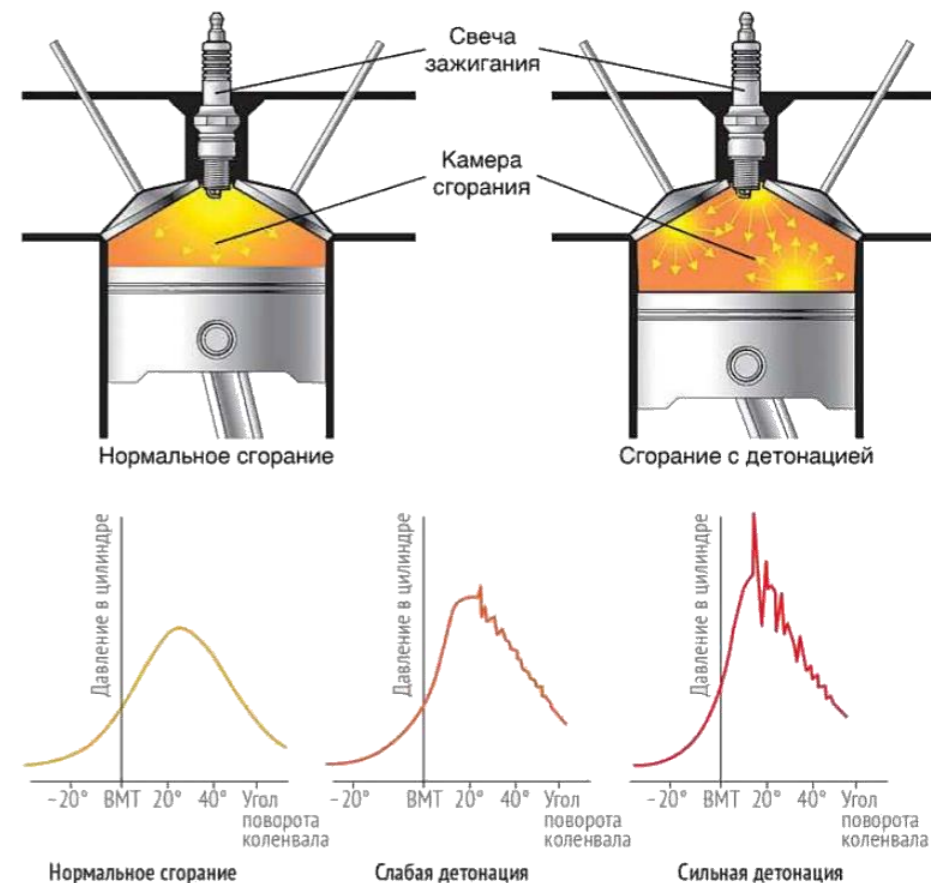
# Avtomobil dvigatetlari uchun **gazsimon yonilg'i**:

➤ **Siqilgan;** ➤ **Suyultirilgan** holatlarda ishlatiladi.

**Gaz-havo** aralashmasining **detonatsiyaga** turg'unligi, **benzin-havo** aralashmasiga qaraganda yuqori bo'ladi.

Bu dvigatelning  $\epsilon$  , iqtisodiy ko'rsatkichlarini .

**Gazli dvigatellarda aralashma deyarli to'liq yonadi** va ishlatilgan gazlarning zaharliligi ancha past bo'lganligidan **atrof-muhit kam zararlanadi**.

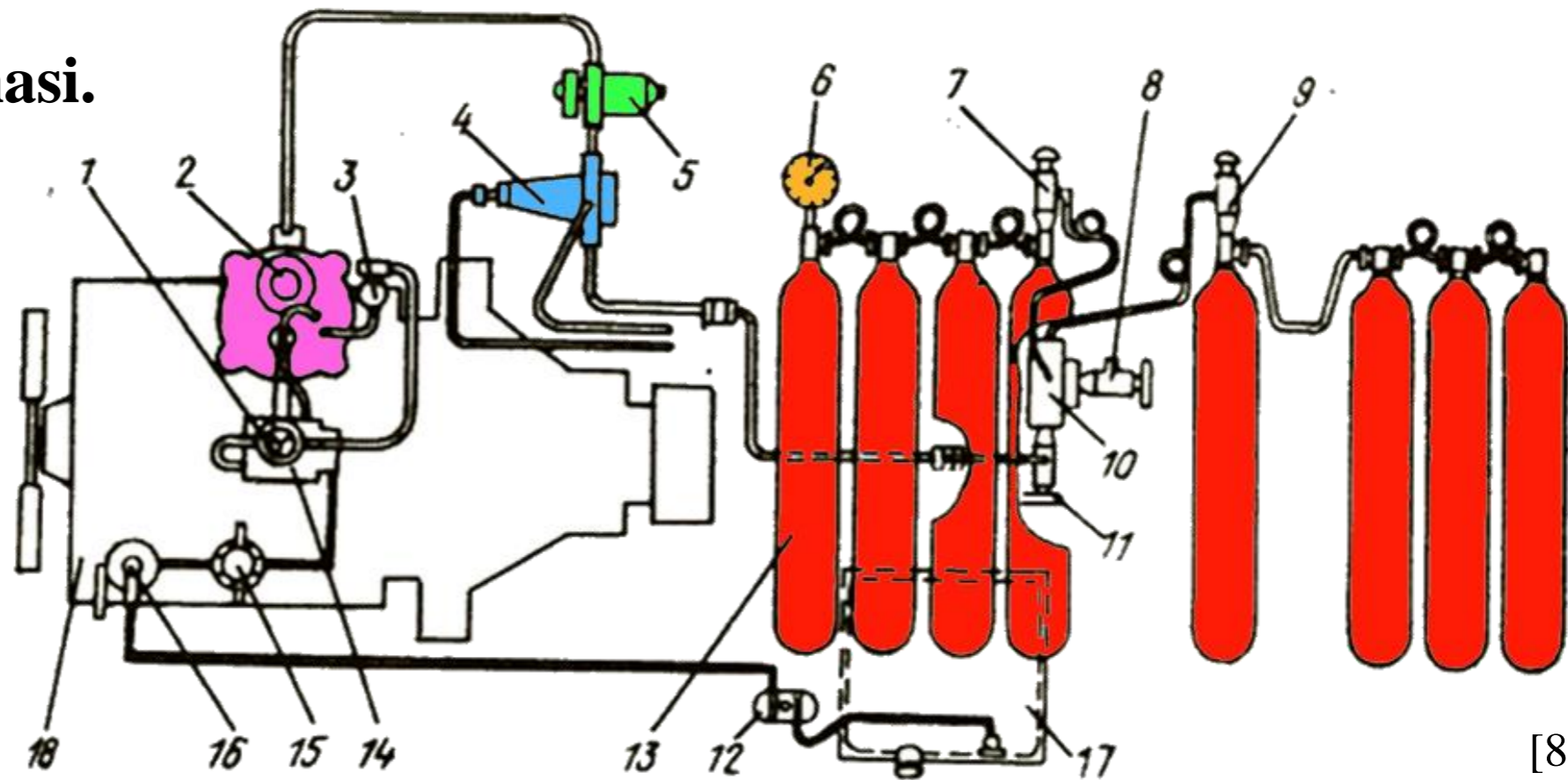


[79]

## 7.6. Gaz bilan ta'minlash tizimi qismlarining konstruksiyasi

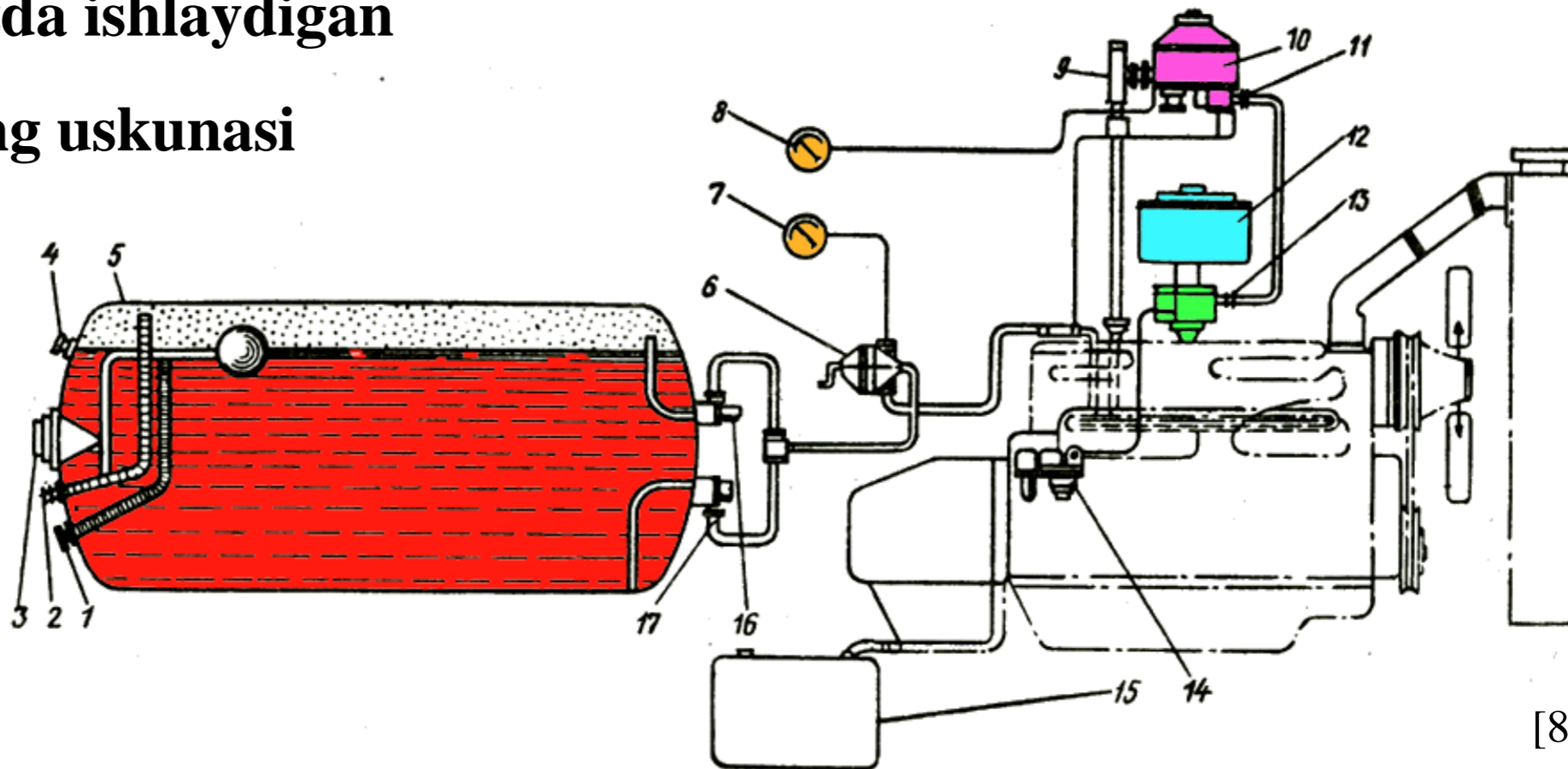
**Siqilgan gazda ishlaydigan  
avtomobilning uskunasini.**

**va ishlashi.**



1-karbyurator-aralashtirgich, 2-past bosimli reduktor, 3-ishga tushirish klapani, 4-yuqori bosimli reduktor, 5-gaz filtrli elektromagnit klapani, 6-yuqori bosimli monometr, 7-old guruh ballonlarining ventili, 8-to'ldirish ventili, 9-ketingi guruh ballonlarining ventili, 10-krestovina, 11-asosiy sarflash ventili, 12-benzinning dag'al tozalash filtri, 13-gaz balloni, 14-karbyurator, 15-elektromagnit klapani mayin tozalash filtri, 16-benzanasos, 17-benzin boki, 18-dvigatel.

## Suyultirilgan gazda ishlaydigan avtomobilning uskunasi



[81]

1-eng yuqori sathni tekshirish ventili, 2-saqлагich klapan, 3-suyuqlik sathini ko'rsatkich, 4-to'ldirish klapani, 6-tarmoq ventili, 7-8-monometrlar, 9-gaz filtri, 10-ikki bosqichli gaz reduktori, 11-mezonlagich (dozator), 12-havo filtri, 13-karbyurator-aralashtirgich, 14-nasos, 15- benzin boki, 16-ishga tushirish, sarflash ventili, 17-muqim ishlatish uchun sarflash ventili.



## Gaz ballonlari:

## Siqiluvchan gaz uchun

Gaz balloni – **20 MPa**

Devorining qalinligi - **6,5÷7,0 mm**

Materiali - Uglerodli va legirlangan po‘lat

Sig‘imi – **50 l** (sarfi **180-220 km**)

Massasi – **100 kg** (1 donasi)

Soni – **1-2 ta** yengil avtomobillarda;

– **5-8 ta** yuk avtomobillarda.



[82]

Ballonlar **30 MPa** bosim ostida **gidravlik sinovdan o‘tkaziladi** va zavod tamg‘asi bosiladi.



## Gaz ballonlari:

## Suyultirilgan gaz uchun

Gaz balloni – **1,6 MPa**

Devorining qalinligi – **5,2÷6,0 mm**

Materiali - Uglerodli po‘lat

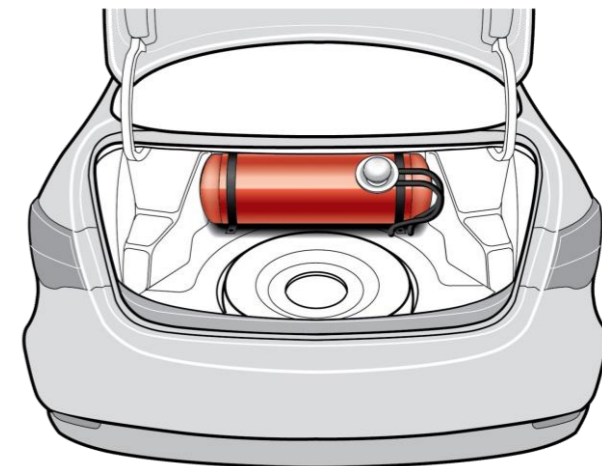
Sig‘imi – **250 l** (sarfi **400-500 km**)

Soni – **1 ta** yengil avtomobillarda;

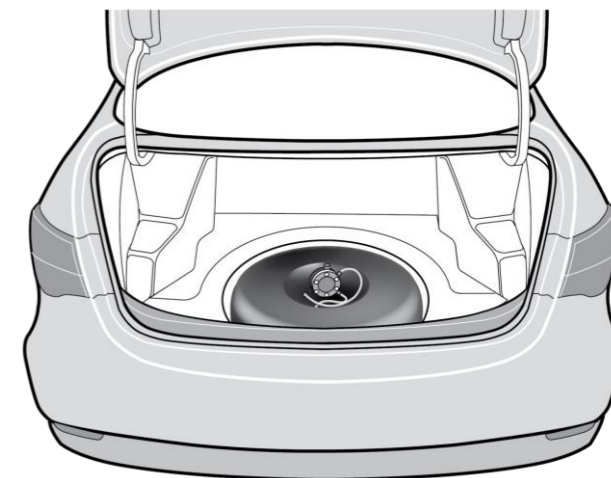
– **2-3 ta** yuk avtomobillarda.

**Gidravlik sinov 2,4 MPa bosim ostida o‘tkaziladi.**

Har ikkala ballonlarda gaz sig‘imidan **90 foizdan ortiq**  
**to‘ldirish man etiladi.**



[83]

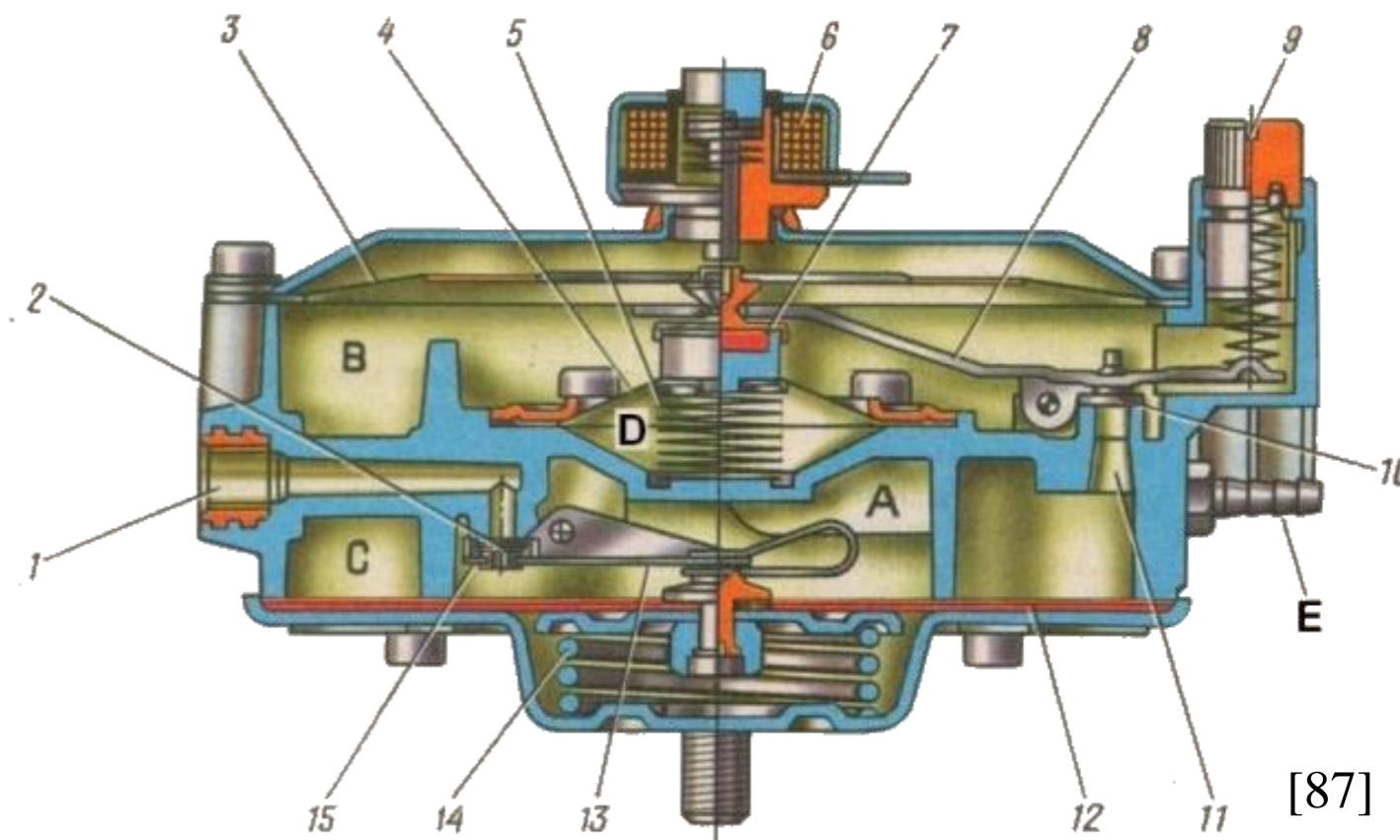


[84]



## Gaz reduktorining konstruksiyasi:

1-gazni kirish kanali; 2-birinchi pog'onaning klapan egari; 3-ikkinchi pog'ona diafragmasi; 4-pasaytiruvchi moslama diafragmasi; 5-pasaytiruvchi moslama prujinasi; 6-elektromagnit qurilma; 7-doimiy magnit; 8-richag; 9-salt ishlashni sozlash vinti; 10-ikkinchi pog'ona klapani; 11-kanal; 12-birinchi pog'ona diafragmasi; 13-richag; 14-prujina; 15-birinchi pog'ona klapan.



[87]

A-birinchi pog'ona kamerasining bo'shlig'i;  
 B-ikkinchi pog'ona kamerasining bo'shlig'i;  
 C-issiqlik almashinish bo'shlig'i;

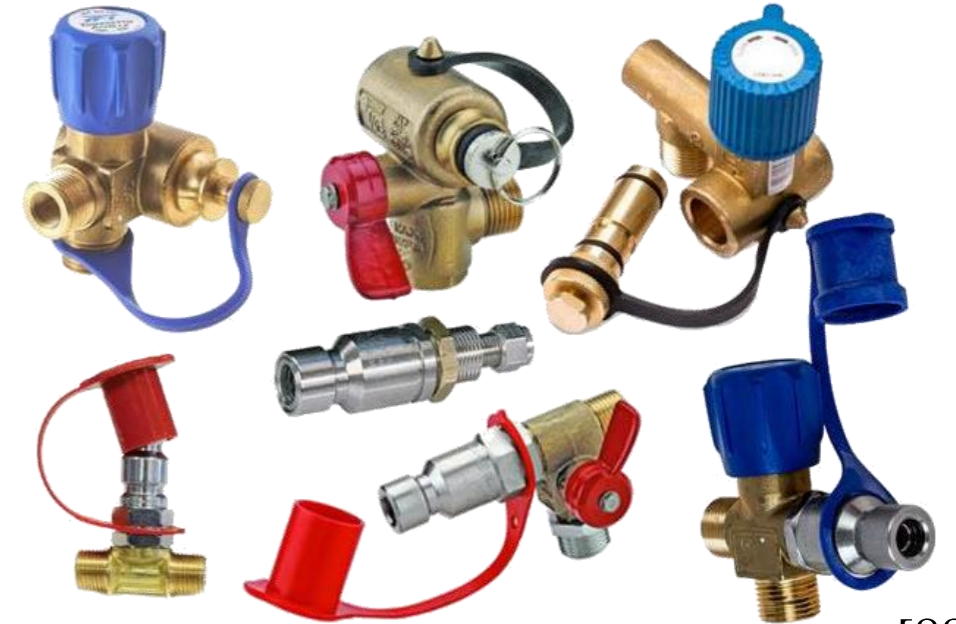
D-pasaytiruvchi moslama bo'shlig'i;  
 E-pasaytiruvchi moslama shtutseri.

## To'ldirish ventili:

Ventil korpusiga egar burab o'rnatilgan, unga doim zichlagichli klapan taqalib turadi.

Korpusdagi to'ldirish teshigi probka bilan berkitilgan.

Teskari klapan, quyish shlangi ajralib qolgan holatda, gazning chiqib ketishining oldini oladi.

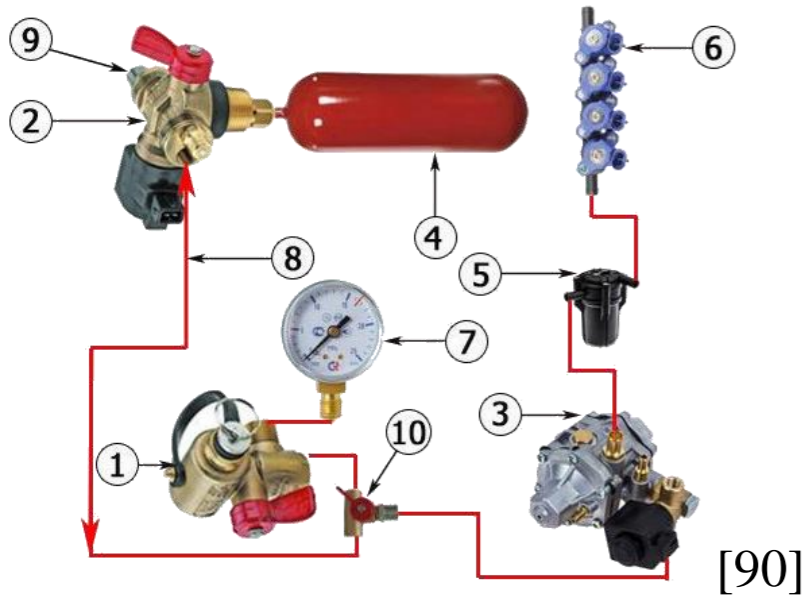


[88]

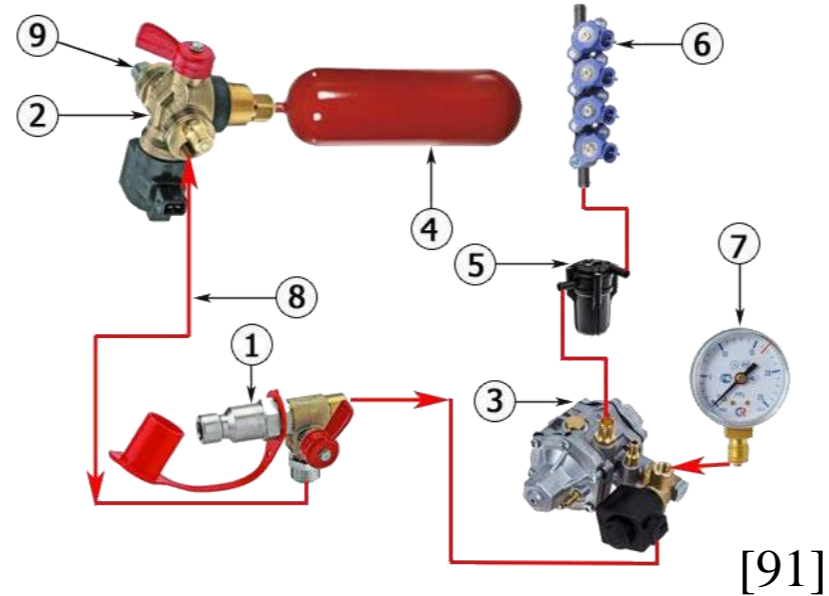


[89]

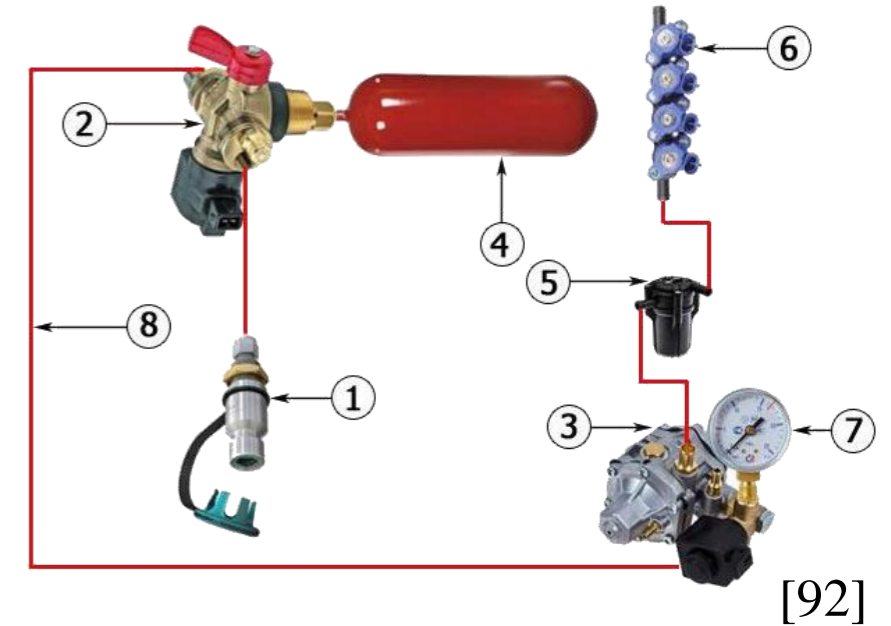
# To'ldirish ventilining konstruksiya variantlari.



**GOST bo'yicha  
manometerli**



**NGV1 ventilli**



**Qaytarish klapanli  
Yevro to'ldirgich**

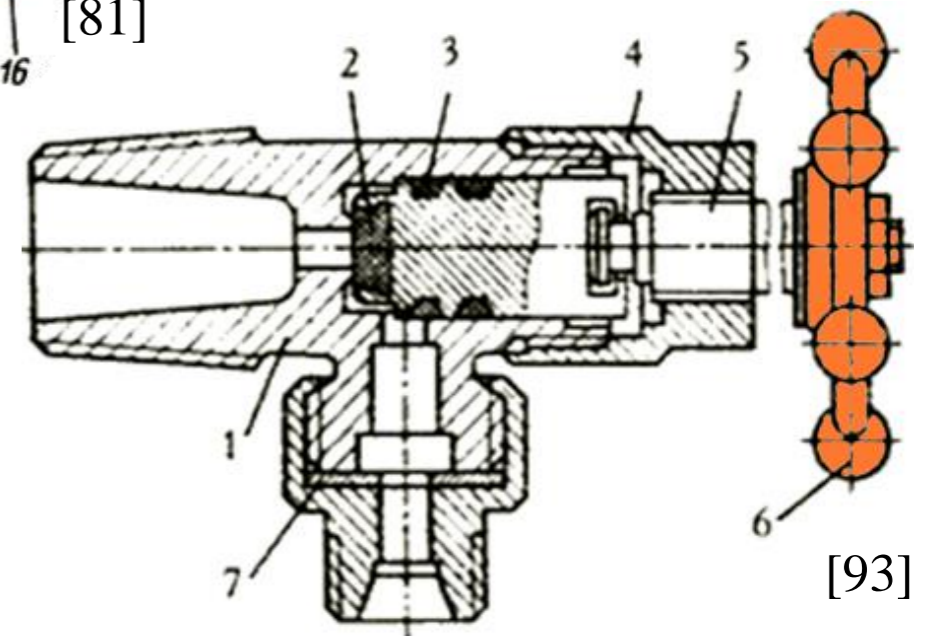
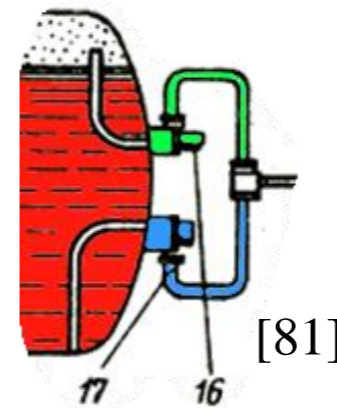
1-to'ldirish ventili; 2-ballon ventili; 3-reduktor; 4-ballon;  
5-past bosimli filtr; 6-injektorlar; 7-monometr; 8-trubka;  
9-tiqin; 10-magistral kanal.

## Sarflash ventili:

U ballondan gaz olishga mo'ljallangan.

**Yuqoridagi sarflash ventilidan** gaz tizimga gazsimon holatda, **pastdagisidan esa** suyuq holatda uzatiladi.

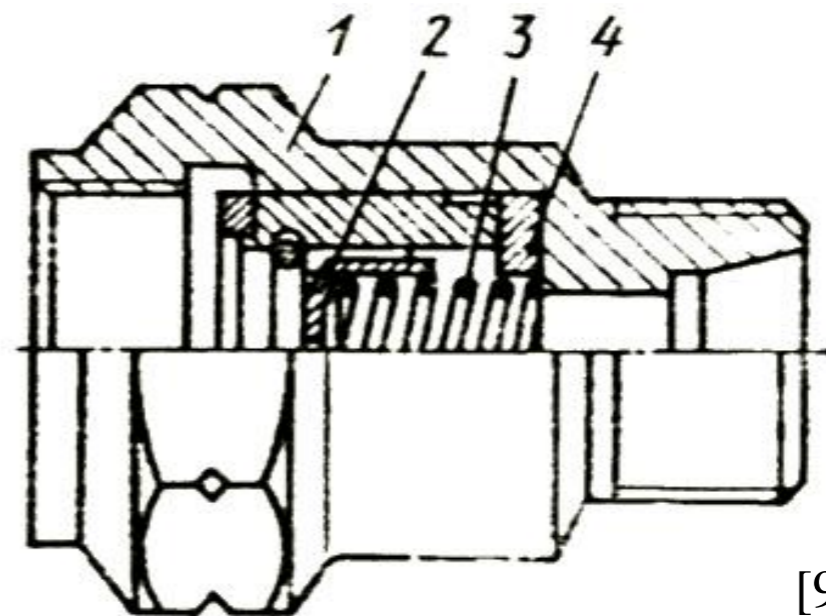
**Maxovik** soat strelkasi bo'ylab buralsa, klapan korpus egaridagi teshikni qaytadan berkitib qo'yadi.



1-korpus; 2-klapan; 3-zichlovchi halqa;  
4-qopqoq; 5-shtok; 6-maxovik; 7-qistirma.

## Tezlik klapani:

Tezlik klapani naychalar tasodifan uzilgan holatda gazning chiqishini cheklash uchun mo'ljallangan, natijada avtomobilning **yong'in xavfsizligi oshadi.**



[93]

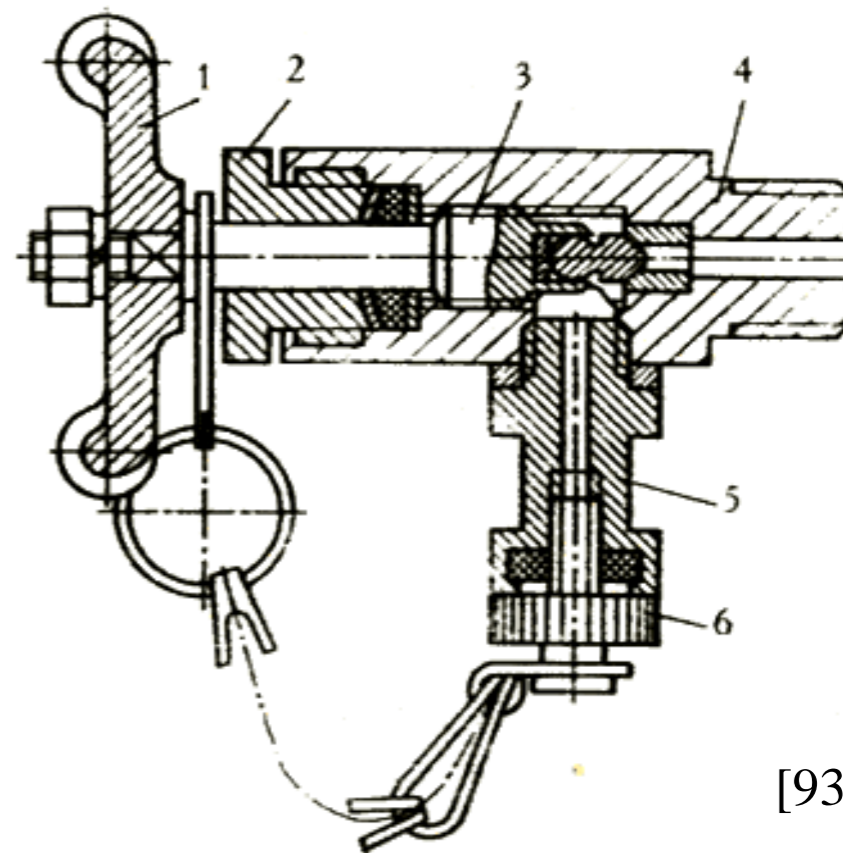
1-korpus; 2-plunjer; 3-prujina; 4-eglar.

## Nazorat ventili:

U ballonning maksimal to‘lganlik paytini aniqlashga mo‘ljallangan.

Ballonga gaz quyishdan avval nazorat ventiling shtutseriga kuzatish qurilmali shlang uchini ulash lozim.

Ballonni to‘ldirish jarayonida nazorat ventili ochiladi va kuzatish qurilmasi yordamida suyultirilgan gazning paydo bo‘lish payti aniqlanadi.



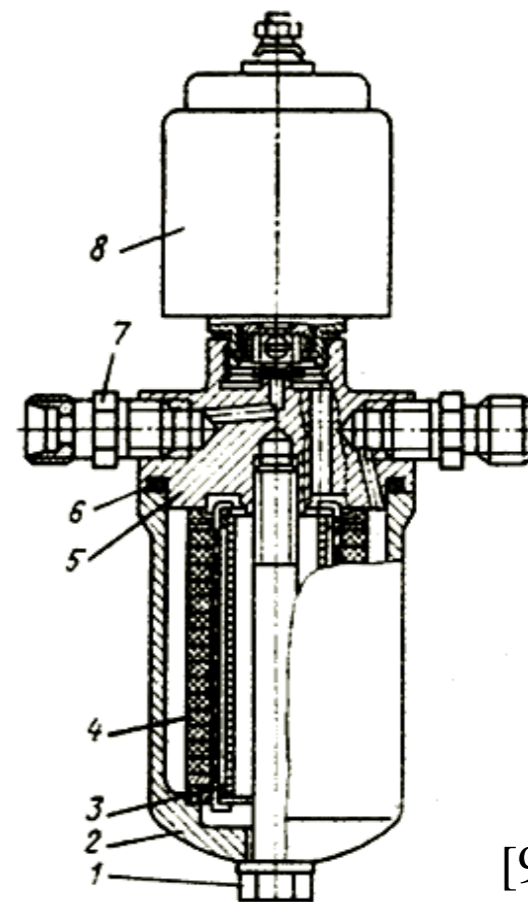
[93]

1-maxovik; 2-yo‘naltirgich; 3-shtok klapani; 4-korpus; 5-shtutser; 6-probka

## Elektromagnitli klapan:

O't oldirish ulanmaganda prujina ta'sirida **elektromagnitning klapani** yopiq turadi va reduktorga gazni o'tkazmaydi.

O't oldirish ulanganda klapan ochiladi va gaz bug'latgichga, so'ngra **reduktorga** hamda **aralashtirgichga o'tadi.**



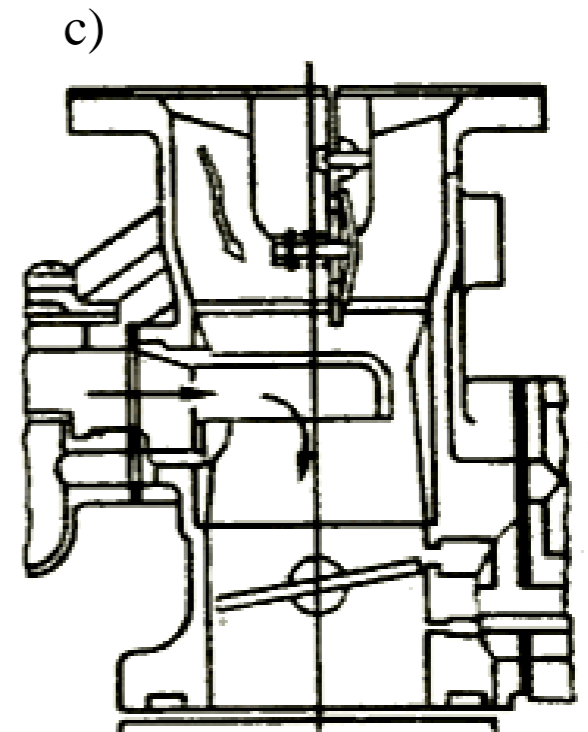
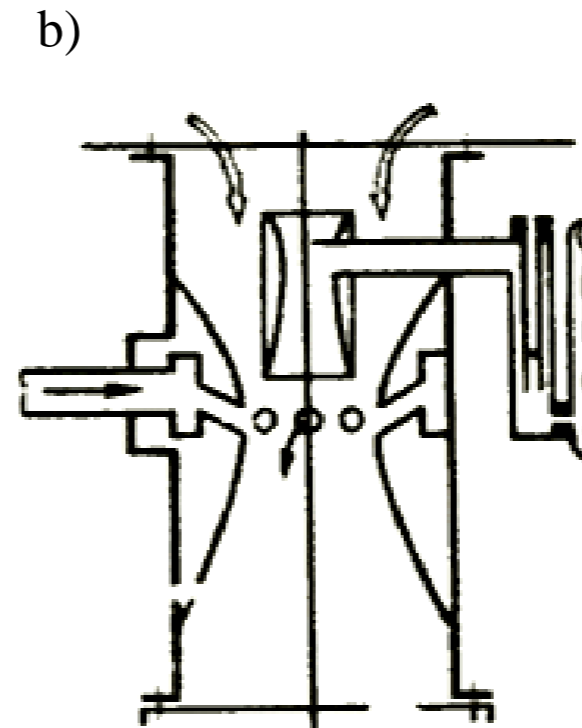
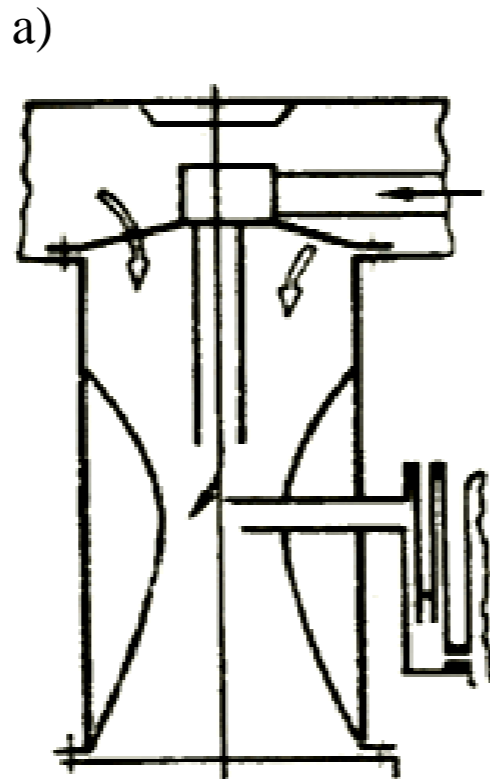
[93]

1-bolt; 2-qopqoq; 3-qistirmalar; 4-filtrlovchi element;  
5-korpus; 6-zichlovchi halqa; 7-shtutser;  
8-elektromagnit klapani.

## Gaz aralashtirgichlar:

Gaz aralashtirgichlarni faqat gaz variantli dvigatel bo'lsa, avtonom asbob sifatida yoki ikki xil yonilg'i (**benzin** va **gaz**) bilan ekspluatatsiya qilish ko'zda tutilgan bo'lsa, karbyurator bilan birgalikda tayyorlanadi.

- a-karbyuralor-  
aralashtirgich;
- b-gazni diffuzor teshiklari  
orqali kirituvchi  
karbyurator-aralashtirgich;
- c-sof gaz dvigateling  
aralashtirgichi.



[93]

70. How Do Propane Vehicles Work? [Online image] [Accessed in 2019]. <https://afdc.energy.gov/vite/assets/propane.e1e0d5c2.jpg>
71. How Do Compressed Natural Gas Class 8 Trucks Work? [Online image] [Accessed in 2019]. [https://afdc.energy.gov/vite/assets/natgas\\_class8.702be1a8.jpg](https://afdc.energy.gov/vite/assets/natgas_class8.702be1a8.jpg)
72. MAN avtobus. Photo taken by S.Yusupov. Tashkent in 2018.
73. How does LPG work? [Online image] [Accessed in 2019]. [https://www.lpgnortheast.co.uk/resources/LPG\\_System\\_Layout.gif?timestamp=1318076756912](https://www.lpgnortheast.co.uk/resources/LPG_System_Layout.gif?timestamp=1318076756912)
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75. Yusupov S. "Avtomobillar konstruksiyasi" 1-qism. O'quv-uslubiy majmua. A.: AndMI. 2019 yil, -b. 138 (493).
76. Гид по метану. Brc Gas Equipment. Газовые установки для транспортных средств. Италия. 27.02.2004. ст. 16, 28, 30, 32.
77. Yusupov S. "Avtomobillar konstruksiyasi" 1-qism. O'quv-uslubiy majmua. A.: AndMI. 2019 yil, -b. 139 (493).
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