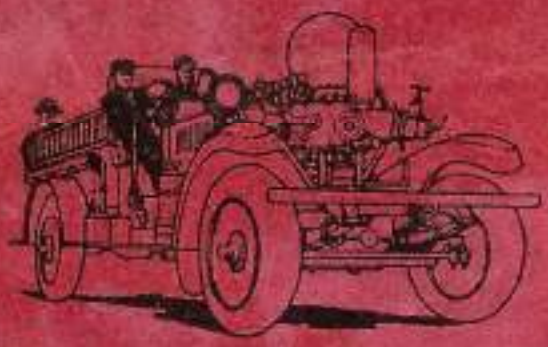
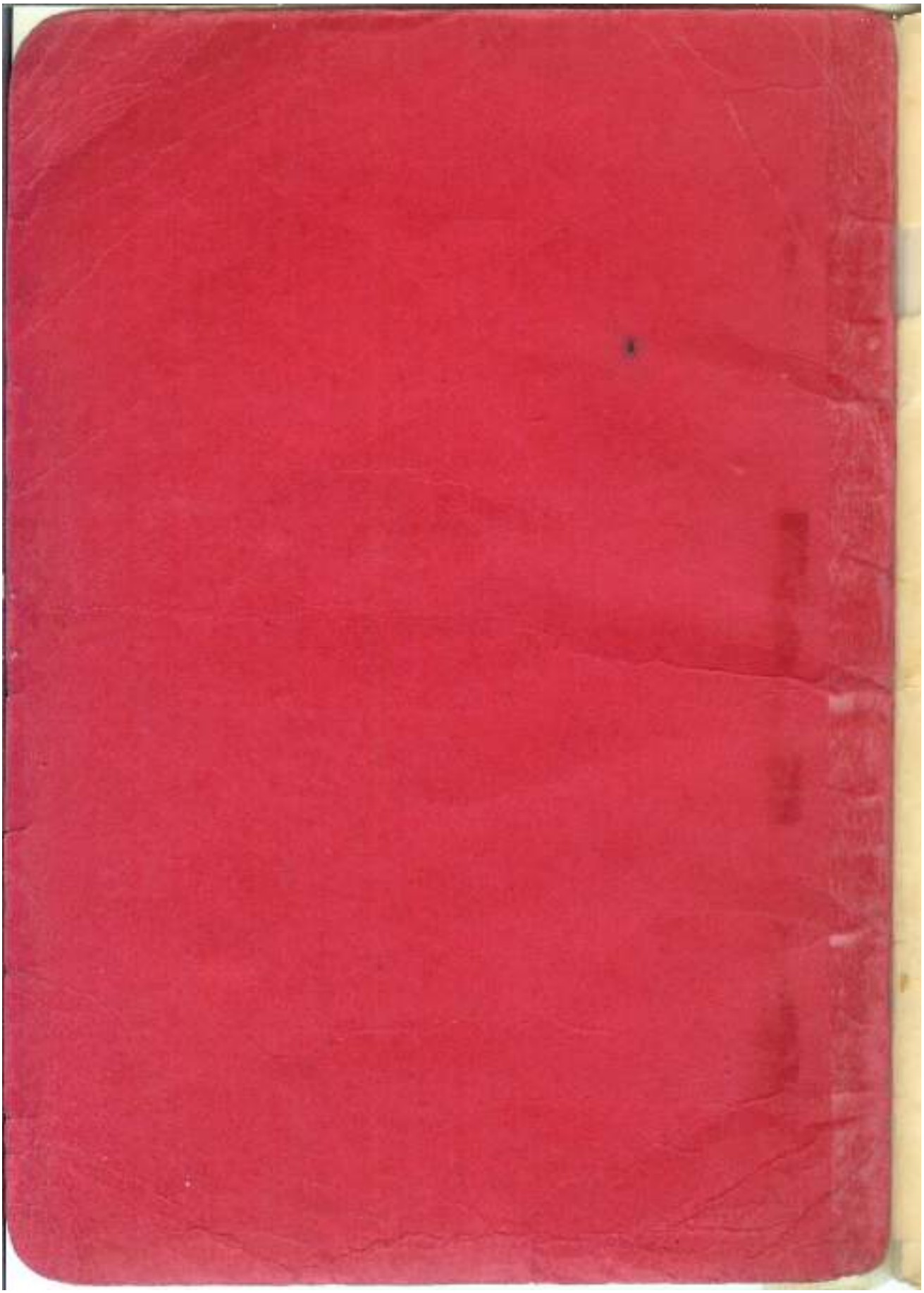
AHRENS FOX



AHRENS-FOX SERVICE

MANUAL



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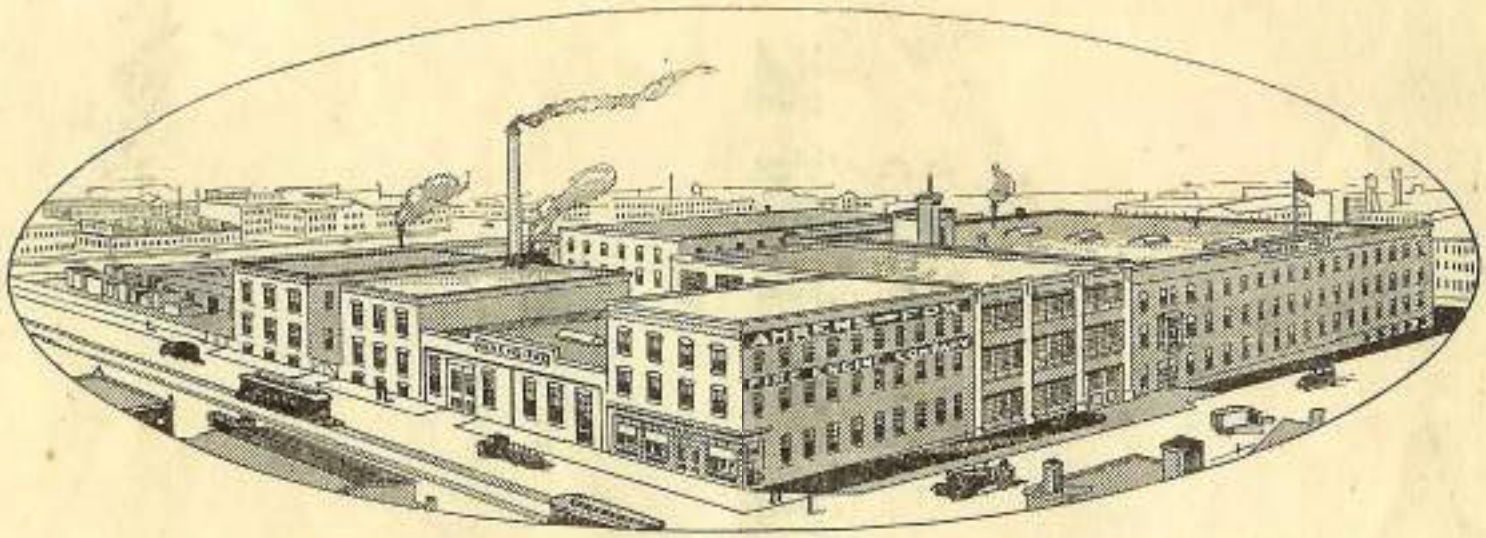
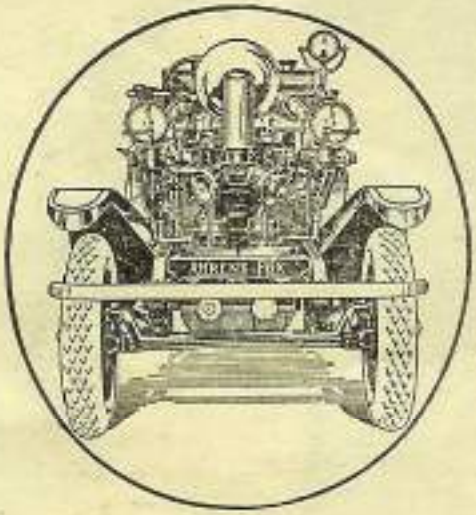


AHRENS-FOX MOTOR FIRE APPARATUS EXCLUSIVELY

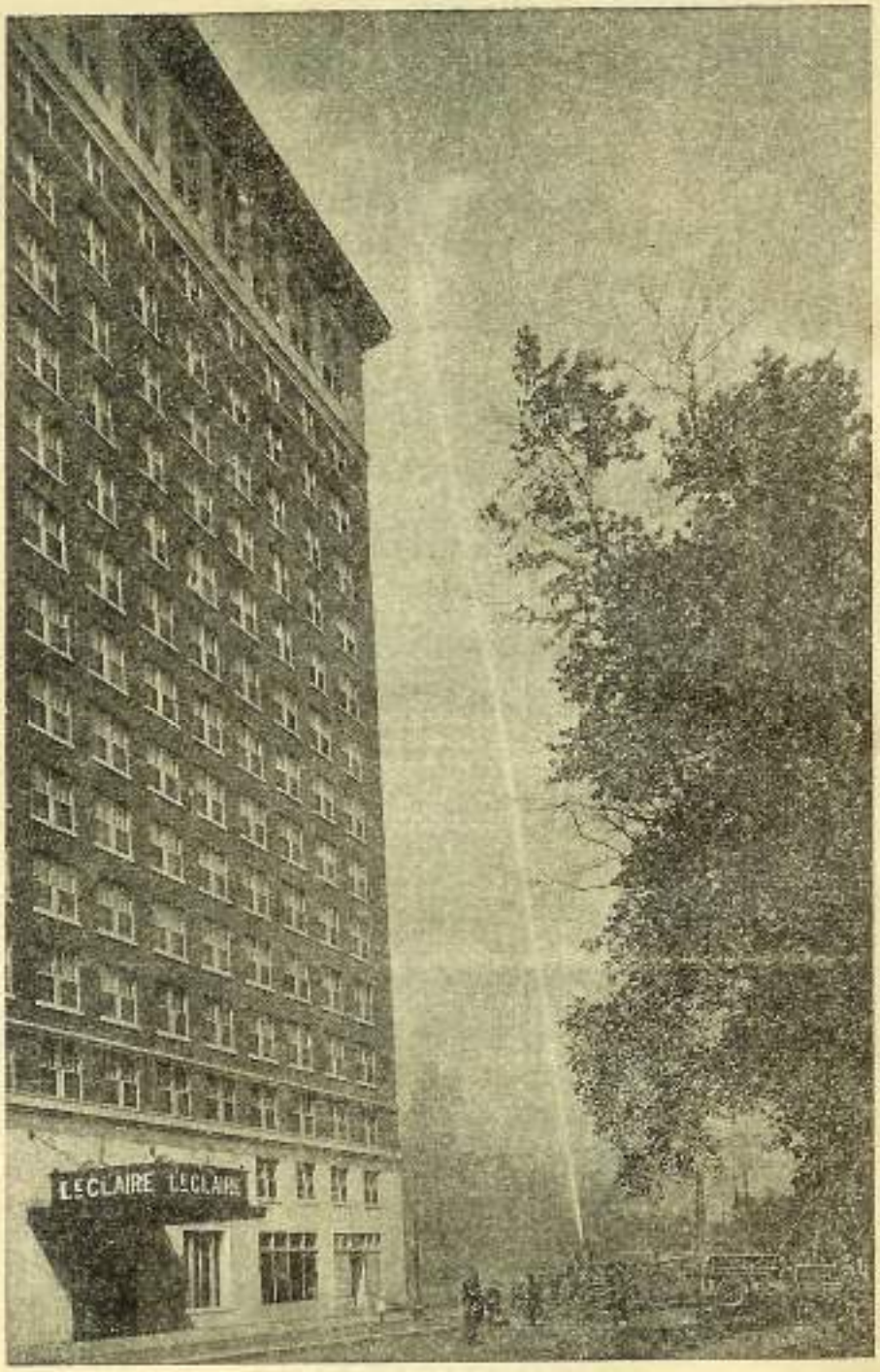
AHRENS-FOX MANUAL

Quality



Next to Quality comes correct Handling
the Importance of which this Book
seeks to impress.

THE AHRENS-FOX FIRE ENGINE COMPANY
CINCINNATI, OHIO.
U. S. A.



TYPICAL DEMONSTRATION WITH AHRENS-FOX PUMP AND HOSE CAR.

AHRENS - FOX

QUALITY is a tenent in the AHRENS-FOX creed.

QUALITY is known to be inherent to all AHRENS-FOX productions. Yet! no matter how good—nothing concerned with the art of man is absolutely exempt from destruction and, amongst forces which destroy, none is to be dreaded more than an unrestrained fire.

AHRENS-FOX Fire Engines are foremost today, amongst machines which are regarded as efficient safeguards against ravishment by conflagration and, in no other field is Quality more essential.

As frequently exemplified by the burning of structures—representative of the best in building construction—so also may fail, the best built apparatus intended to preserve man's mastery over fire.

Attention is particularly directed to the *FINAL WORDS OF WARNING* appearing on Page 55.

FRICTION LOSS

BEST QUALITY RUBBER LINED FIRE HOSE

GALLONS — POUNDS PRESSURE LOST EACH 100 FEET LENGTH

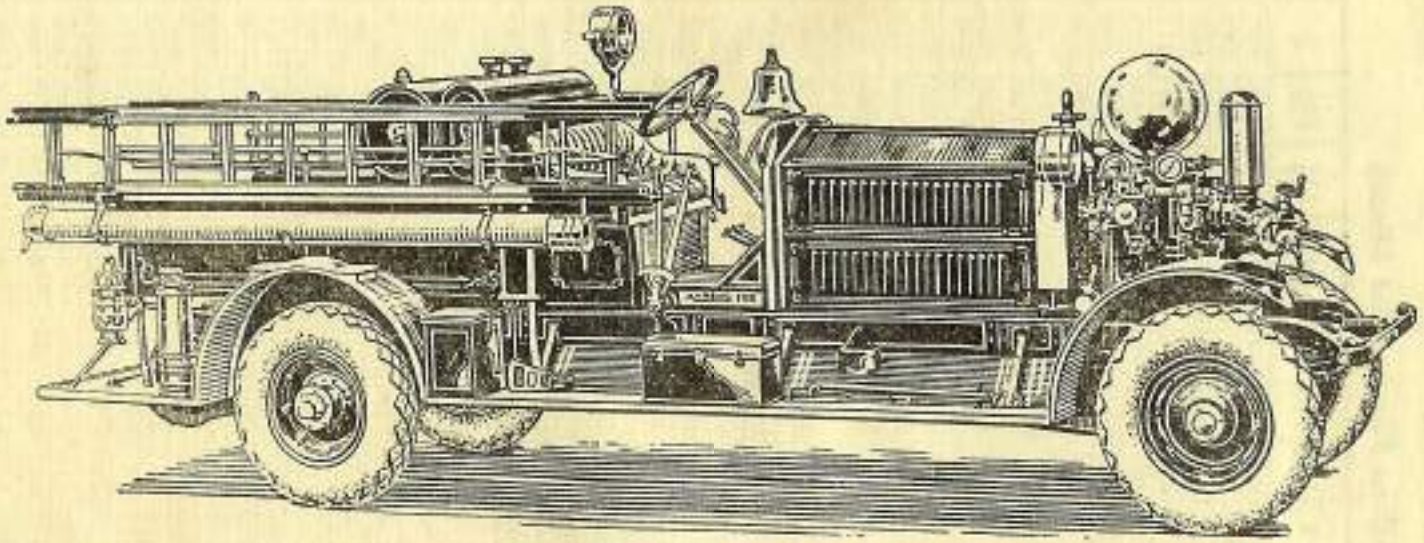
WATER FLOWING PER MINUTE	2½" SINGLE LINE	2½" 2 LINES Siamesed	3" SINGLE LINE	3½" SINGLE LINE
140	5.2	1.4	2.0	0.9
160	6.6	1.9	2.6	1.2
180	8.3	2.3	3.2	1.5
200	10.1	2.8	3.9	1.8
220	12.0	3.3	4.2	2.1
240	14.1	3.9	5.4	2.5
260	16.4	4.5	6.3	2.9
280	18.7	5.2	7.2	3.3
300	21.2	5.9	8.2	3.7
320	23.8	6.6	9.3	4.2
340	26.9	7.4	10.5	4.7
360	30.0	8.3	11.5	5.2
380	33.0	9.2	12.8	5.8
400	36.2	10.1	14.1	6.3
425	40.8	11.3	15.7	7.0
450	45.2	12.5	17.5	7.9
475	50.0	13.8	19.3	8.7
500	55.0	15.2	21.2	9.5
525		16.6	23.2	10.5
550		18.1	25.2	11.4
575		19.0	27.5	12.4
600		21.2	29.9	13.4
625		23.0	32.0	14.4
650		24.8	34.5	15.5
675		26.5	37.0	16.6
700		28.3	39.5	17.7
725		30.2	42.3	18.9
750		32.2	45.0	20.1
775		34.2	47.6	21.4
800		36.2	50.5	22.7
825		38.4	53.5	24.0
850		40.7	56.5	25.4
875		43.1	59.7	26.8
900		45.2	63.0	28.2
1,000		55.0	76.5	34.3
1,100		65.5	91.5	41.0

DISCHARGE

SMOOTH BORE NOZZLES

Gallons Flowing per Minute

Pressure Pitot Gage	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 3/8	1 3/4	1 7/8	2
30	63	91	124	162	205	253	307	365	429	498	572	651
32	65	94	128	167	212	261	317	377	443	514	591	673
34	67	97	132	172	218	269	327	389	457	530	610	693
36	69	100	136	177	224	277	336	400	470	546	627	713
38	71	102	140	182	231	285	345	411	483	561	645	733
40	73	105	143	187	237	292	354	422	496	575	661	752
42	74	108	147	192	243	299	363	432	508	589	678	770
44	76	110	150	196	248	306	372	442	520	603	694	788
46	78	113	154	200	254	313	380	452	531	617	710	806
48	80	115	157	205	259	320	388	462	543	630	725	824
50	81	118	160	209	265	326	396	472	554	643	740	841
52	83	120	164	213	270	333	404	481	565	656	754	857
54	84	122	167	217	275	339	412	490	576	668	769	873
56	86	124	170	221	280	345	419	499	586	680	782	889
58	87	127	173	225	285	351	426	508	596	692	796	905
60	89	129	176	229	290	357	434	517	607	704	810	920
62	90	131	179	233	295	363	441	525	617	716	823	936
64	92	133	181	237	299	369	448	533	627	727	836	951
66	93	135	184	240	304	375	455	542	636	738	850	965
68	95	137	187	244	308	381	462	550	646	750	862	980
70	96	139	190	247	313	386	469	558	655	761	875	994
72	97	141	192	251	318	391	475	566	665	771	887	1008
74	99	143	195	254	322	397	482	574	674	782	900	1023
76	100	145	198	258	326	402	488	582	683	792	911	1036
78	101	147	200	261	330	407	494	589	692	803	924	1050
80	103	149	203	264	335	413	500	596	700	813	935	1063
82	104	151	205	268	339	418	507	604	709	823	946	1076
84	105	152	208	271	343	423	513	611	718	833	959	1089
86	107	154	210	274	347	428	519	618	726	843	970	1102
88	108	156	213	277	351	433	525	626	735	853	981	1115
90	109	158	215	280	355	438	531	633	743	862	992	1128
92	110	160	218	283	359	443	537	640	751	872	1002	1140
94	111	161	220	286	363	447	543	647	759	881	1012	1152
96	113	163	222	289	367	452	549	654	767	890	1022	1164
98	114	165	225	292	370	456	554	660	775	900	1032	1176
100	115	166	227	295	374	461	560	667	783	909	1043	1189
105	118	170	233	303	383	473	574	683	803	932	1070	1218
110	121	174	238	310	392	484	588	699	822	954	1095	1247
115	123	178	243	317	401	495	600	715	840	975	1120	1275
120	126	182	249	324	410	505	613	730	858	996	1144	1303
125	129	186	254	331	419	516	626	745	876	1016	1168	1329
130	131	190	259	337	427	526	638	760	893	1036	1191	1356
135	134	193	264	343	435	536	650	775	910	1056	1213	1382
140	136	197	269	350	443	546	662	789	927	1076	1235	1407
145	139	200	273	356	450	556	674	803	944	1095	1257	1432



AHRENS-FOX PUMP AND HOSE CAR

Always give Register Number appearing on Name Plate of Apparatus when ordering parts for replacement.

Getting Ready for Service

PREPAREDNESS—So there may be no delay the following hints can be checked against in the order here presented.

An Ahrens-Fox Record

1. *Engine Crank Case:* supplied with suitable oil to the proper level.

2. *Transmission:* Gear Case filled with lubricant.

3. *Lubrication in General:* all mechanism properly oiled; includes filling of oil and grease cups.

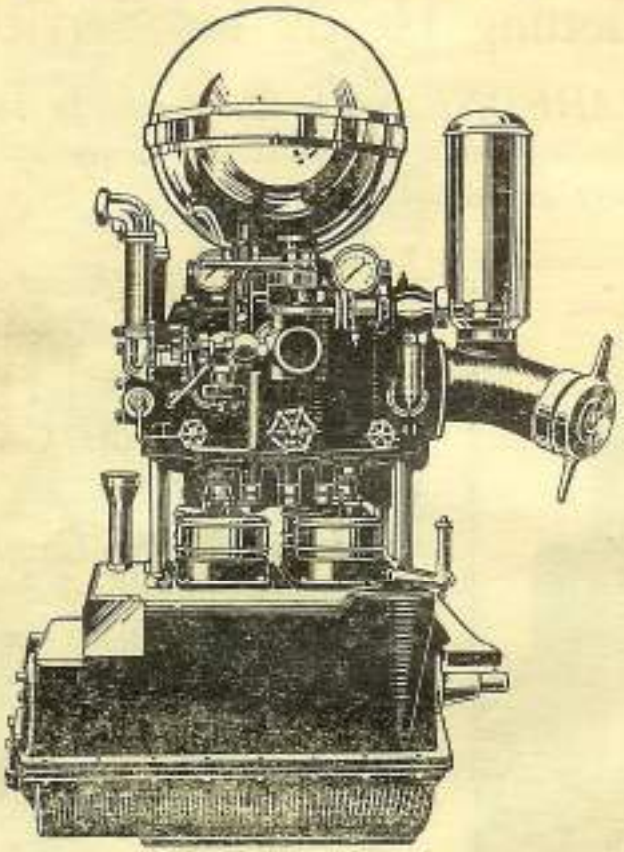
4. *Radiator:* filled with clean water, including inspection of pump, hose connections, fan and fan drive belt.

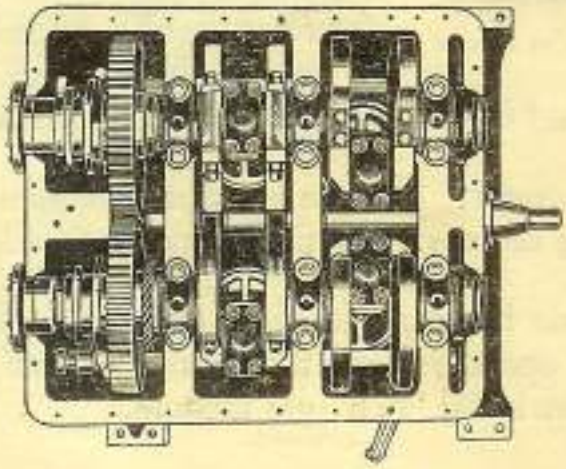
5. *Fuel Tank:* filled to capacity; note position of gasoline cock on tank and inspect pipe line and connections.

6. *Carburetor:* observe outward condition; inspect controlling devices. Do not tamper with adjustments.

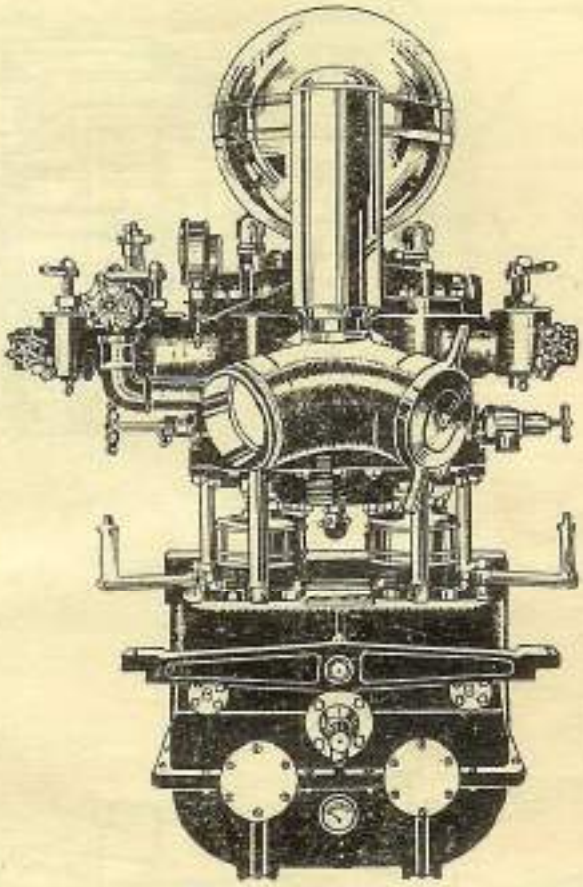
Become familiar with the action of the Regulator —usually operative from the steering column—and set same for an initial "rich" gas mixture.

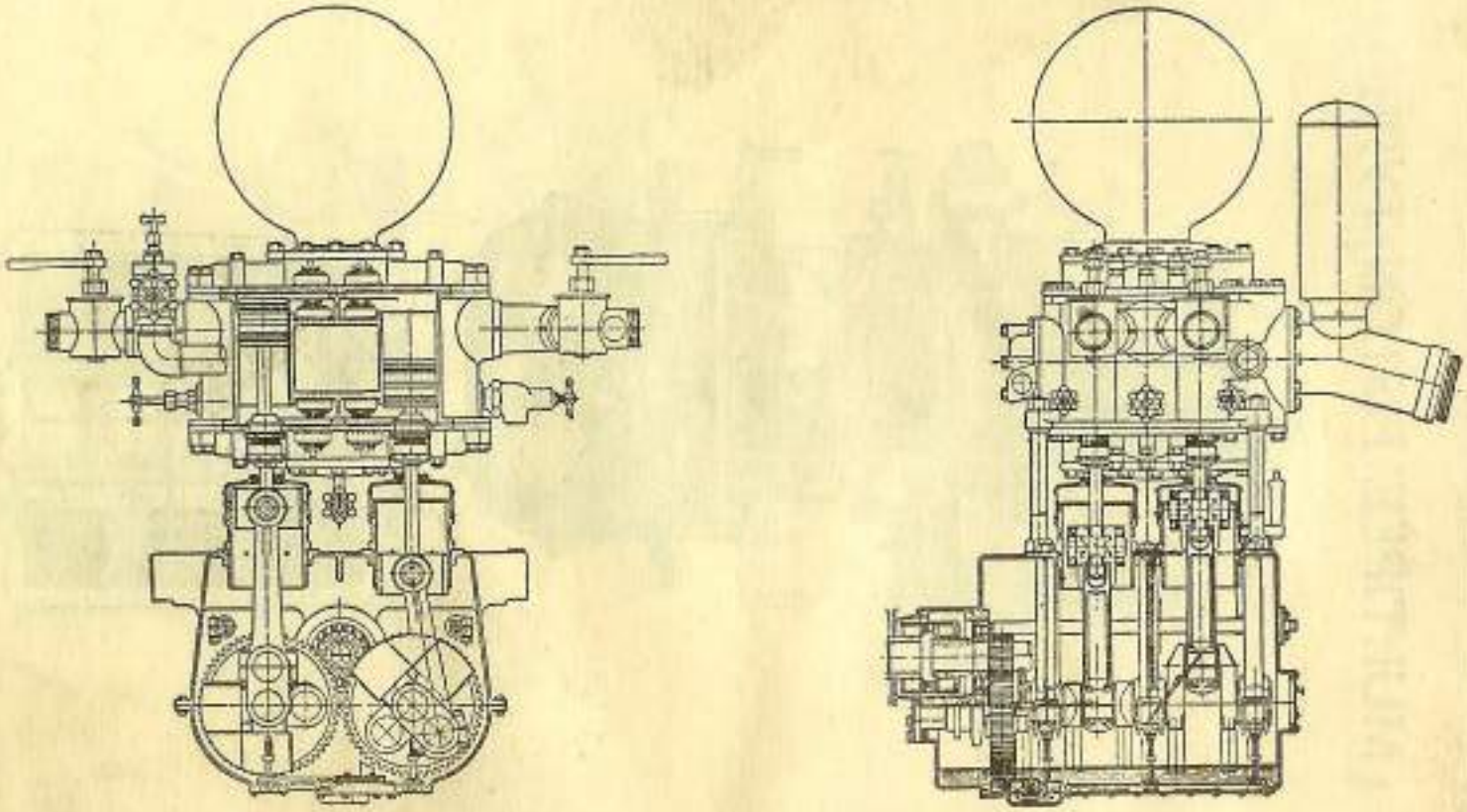
AHRENS-FOX—PUMPING UNIT





MULTIPLE PISTON TYPE





Sectional Views of Ahrens-Fox Pumping Unit—Multiple Piston Type

7. *Ignition:* get acquainted with the systems. Inspect wiring and connections. See that outside of spark plugs are clean.

All terminals must be fastened for effective contact.

8. *Battery:* note if filled and properly active. A rough test may be made by noting intensity of lights.

9. *Ammeter:* on dash—should register at Zero when engine is at rest.

10. *Electric Switches:* all should be in "off" position when engine is not running.

11. *Electric Lights:* in proper burning order. Try all the switches. Inspect condition of wiring and all connections.

12. *Oil Lamps:* if any, to be filled and trimmed.

13. *Gear Shift:* examine for freedom of movement.

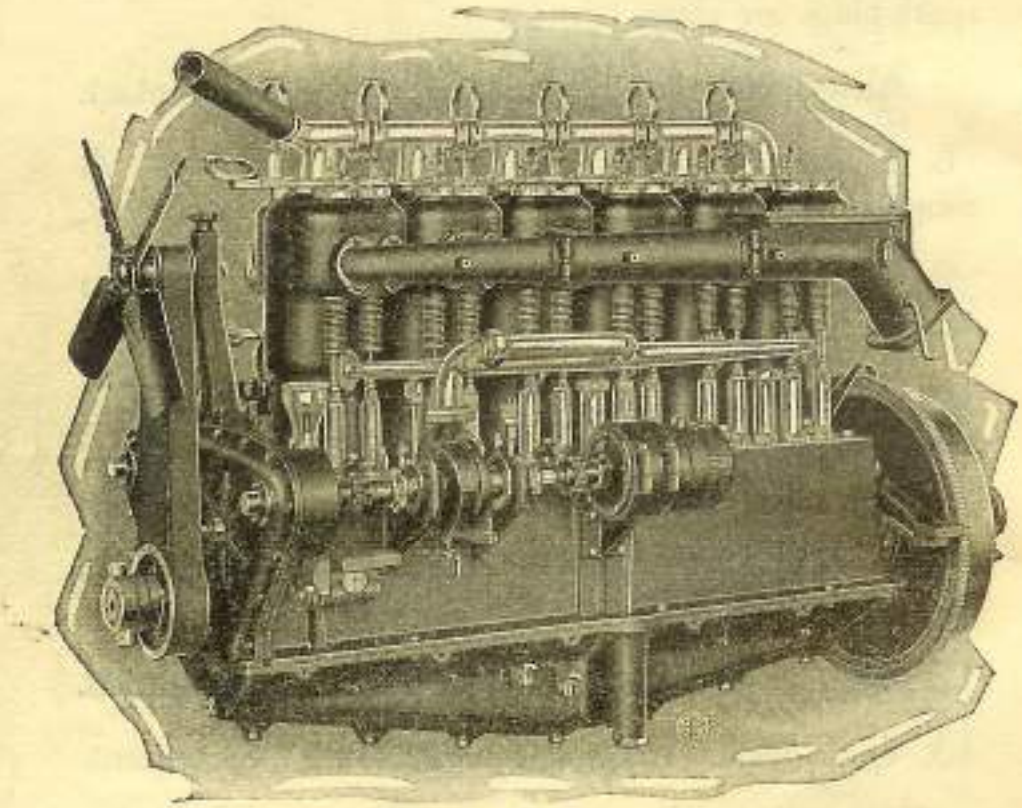
Shifting lever always to be set in its neutral position when apparatus is stationary.

14. *Brakes:* note general condition and inspect for integrity of action.

Emergency brake lever usually is kept set up in quarters.

15. *Chock Blocks:* should be carried for emergency use.

AHRENS-FOX—MOTORS

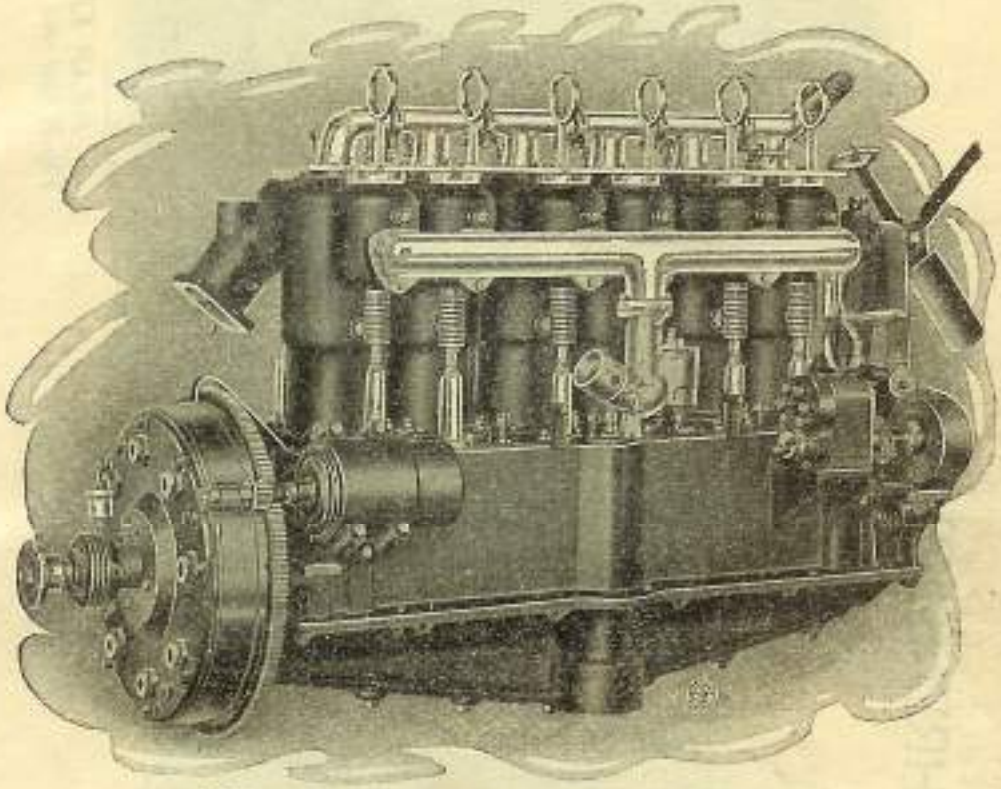


EXHAUST SIDE—SIX CYLINDER TYPE

All except earlier Models have Dual Exhaust Valves.

Duplicate Parts:
For Replacements are always available.
Give Registered Number of Apparatus.

AHRENS-FOX—MOTORS

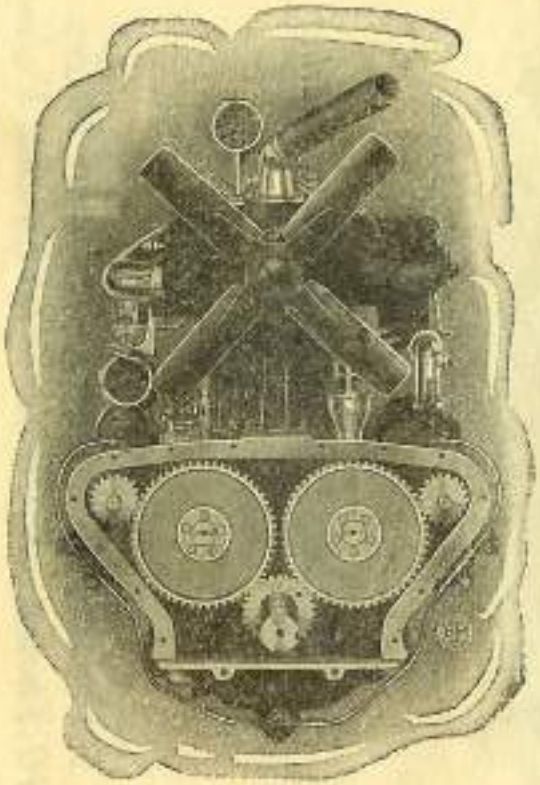


INTAKE SIDE—SIX CYLINDER TYPE

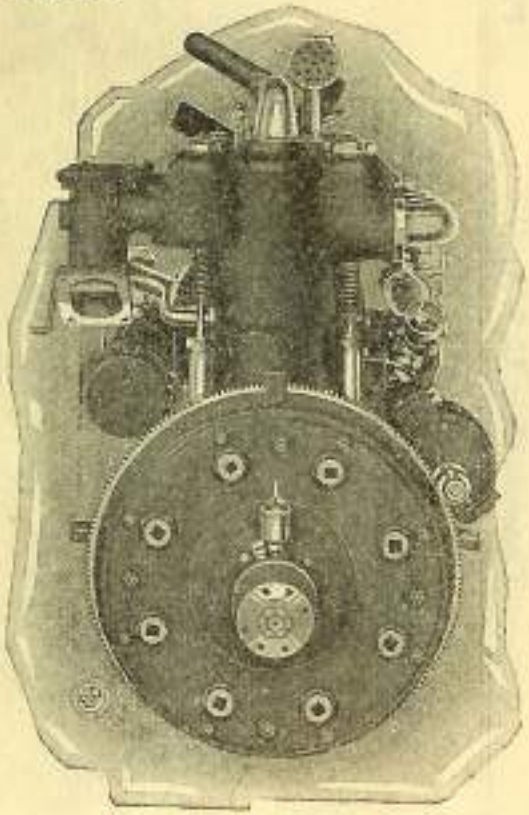
Valve Timing is given by Marks appearing on the Fly Wheel.

Tappet Adjustments:
5 Thousandths Clearance for Intake Valves.
10 Thousandths Clearance for Exhaust Valves.

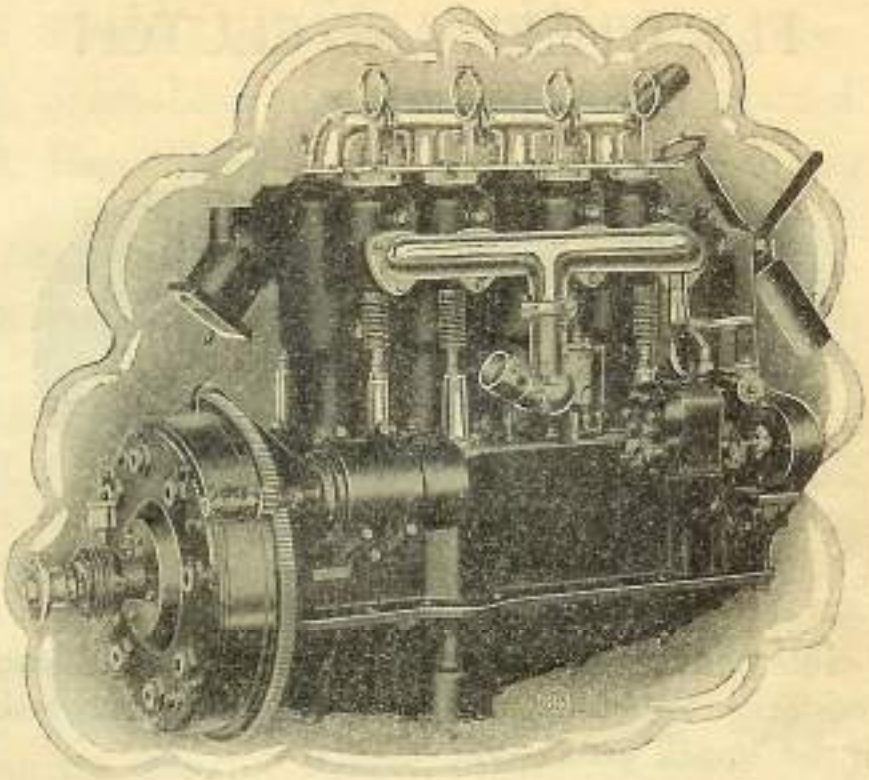
AHRENS-FOX-MOTORS

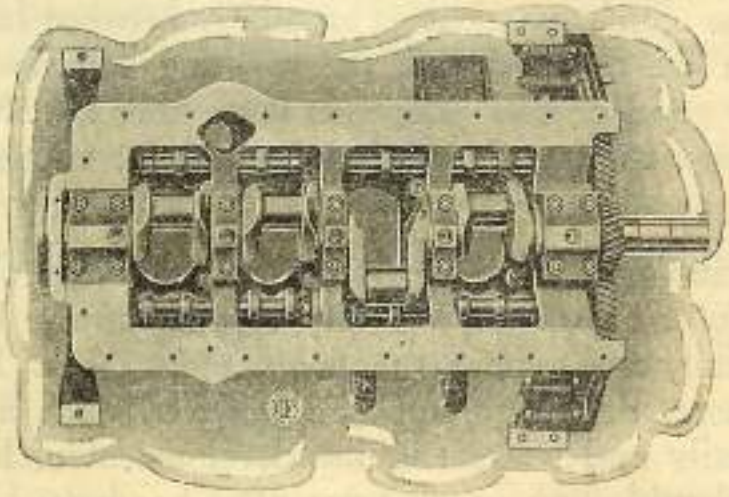


FRONT END
Showing Timing Gears



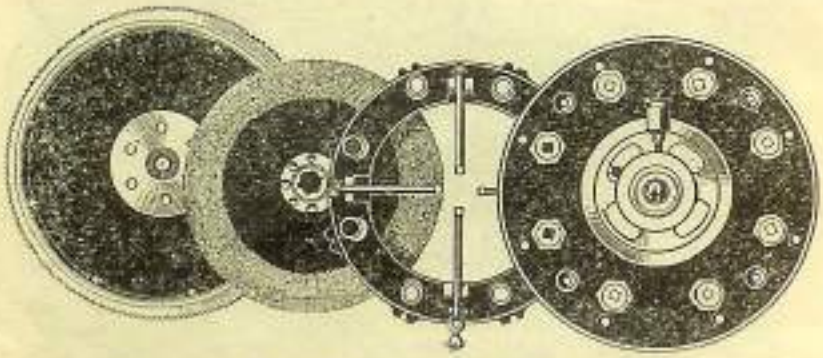
REAR END
Fly Wheel and Clutch





Four Cylinder Motor—Crank Shaft has Five Bearings
Six Cylinder Motor—Crank Shaft has Seven Bearings

FLY WHEEL AND CLUTCH



Improved Dry Plate Clutch—"Velvet Grip"

Interposed between the source of power and load resistance, the clutch unit performs an arduous task in the "quick get-away."

The clutch functions as an arbiter between forces which are opposed and, the resulting behaviour—either good or bad—depends upon how the clutch members subdue the clashing tendencies which attend.

Grabbing tendencies cannot be tolerated. The needful trait rather, is ability to pick up the load gradually and to impart motion without shock. Furthermore, this result must be achieved quite automatically and without undue development of heat, nor, should slippage continue after headway is attained.

16. *Throttle:* on steering post; about one-third open.

17. *Spark Lever:* on steering post; fully retarded.

18. *Pump Crank Case:* supplied with suitable oil to the proper level. Note high and low level cocks at front of pump drive crank case.

19. *Pump Clutches:* should be disengaged. In the "off" position control levers swing toward the front of machine.

20. *Pumps:* the water remaining, which does not run out of suction inlets, is ordinarily sufficient to keep the pump moist and primed for action.

21. *Air Cocks:* on pumps to be kept closed. These are used only when pumps go into action.

22. *Discharge Gates:* at side of pump, together with the drain or bleeder valves attached thereto, should be closed. Become familiar with the "on" and "off" positions according to direction of handles.

23. *Suction Inlet:* at front of pump—closed by caps. See that wire strainer inside is clean and in place. Threaded cups should come off readily by hand.

24. *By-Pass, or "Churn" Valve:* at right side of pump. Keep this open in quarters. The purpose of this valve is to permit action of the pump without choking when discharge gates are closed.

25. *Radiator Feed Valve:* at right side of pump —keep closed. This connection permits injecting water into engine cooling system.

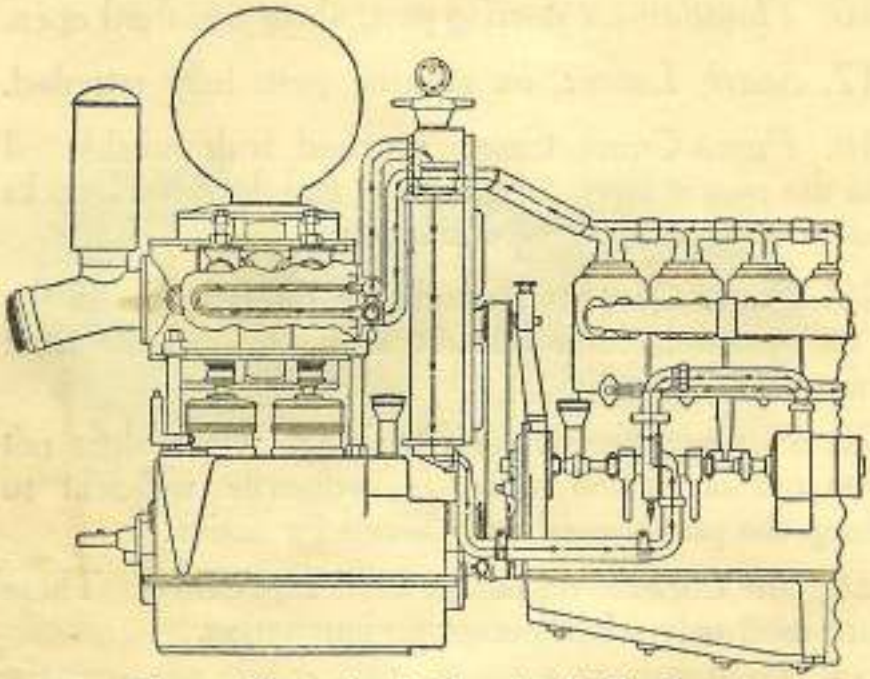


Diagram Illustrating the Complete Cooling System

Radiator capacity alone is inadequate in any motor fire engine to dissipate the heat developed by its power plant when the pumps are worked vigorously.

Common recourse is to bleed water from the fire pump into the ordinary cooling system, creating a messy situation under foot by the overflowing stream. This method is crude and objectionable because foreign matter thus carried into the cooling system impedes circulation and ultimately tends to put the engine out of service.

26. *Auxiliary Cooler:* Keep regulator in "off" position. Familiarize yourself with the purpose and methods of operating this device.

27. *Gas Throttle:* forward at both sides of pump. Keep this in the "off" position, except when operating the pumps.

28. *Relief Valves*: Ahrens-Fox Pumps are equipped with a Pop Safety Relief Valve—on left side to guard against over-pressure.

When additional Relief Valves are provided for controlling the fire streams, it is preferable to leave the "Return Cocks" open. Further instructions appear elsewhere.

29. *Suction Hose:* Be sure couplings are always provided with fresh and sound gaskets. The swivels on all connections should work freely; all threads to be kept clean and otherwise fit for use.

No pump can work successfully at "draft" unless connections are air tight.

30. *Hydrant Wrenches:* Hose and Suction Spanners and other similar tools must be carried in some convenient way.

Do not overlook having available, the special "lock block" which fits the gear shift and prevents accidental engagement of road gears while pumps are in action.

Know exactly where to put your hands on things which are necessary to meet emergency needs.

31. **Caution:** Never attempt to start on Battery Ignition—either with the self-starter or by hand cranking—unless certain that the SPARK IS FULLY RETARDED.

Failure to observe this warning may rupture parts associated with the starting device or, if the cranking is done by hand, serious personal injuries may result.

Starting the Engine

Driver in the seat, the customary procedure does not vary much from the outline which follows:

Note: Ahrens-Fox Standard Equipment comprises a High Tension Independent Magneto and Electric Battery Ignition; both systems are absolutely distinct and operating on separate sets of spark plugs, they have nothing in common.

32. *Switch on "B"* putting Battery Ignition into circuit. Observe that this automatically sets the starter shaft rolling to facilitate engagement of starter pinion with the gear encircling the fly wheel rim.

33. *Depress Electric Starter Pedal*—pushing with decision—sending the pedal to its extreme downward position.

Rotation of engine crank shaft begins under impulse of the electric motor and following a few revolutions the initial explosion should start the engine promptly on its own power.

34. *Release Quickly:* remove foot immediately when engine starts.

Failure in this particular keeps the pinion gear in mesh and the high speed resulting—if too long continued—will endanger the over-running clutches provided in the starting mechanism.

35. *Advance the Spark* after the engine is started.
36. *Adjust the Hand Gas Throttle* to idling speed. At the same time also adjust the Carburetor Regulator—on steering post—to the best running position.

37. *Switch on "M"* bringing Magneto into commission.

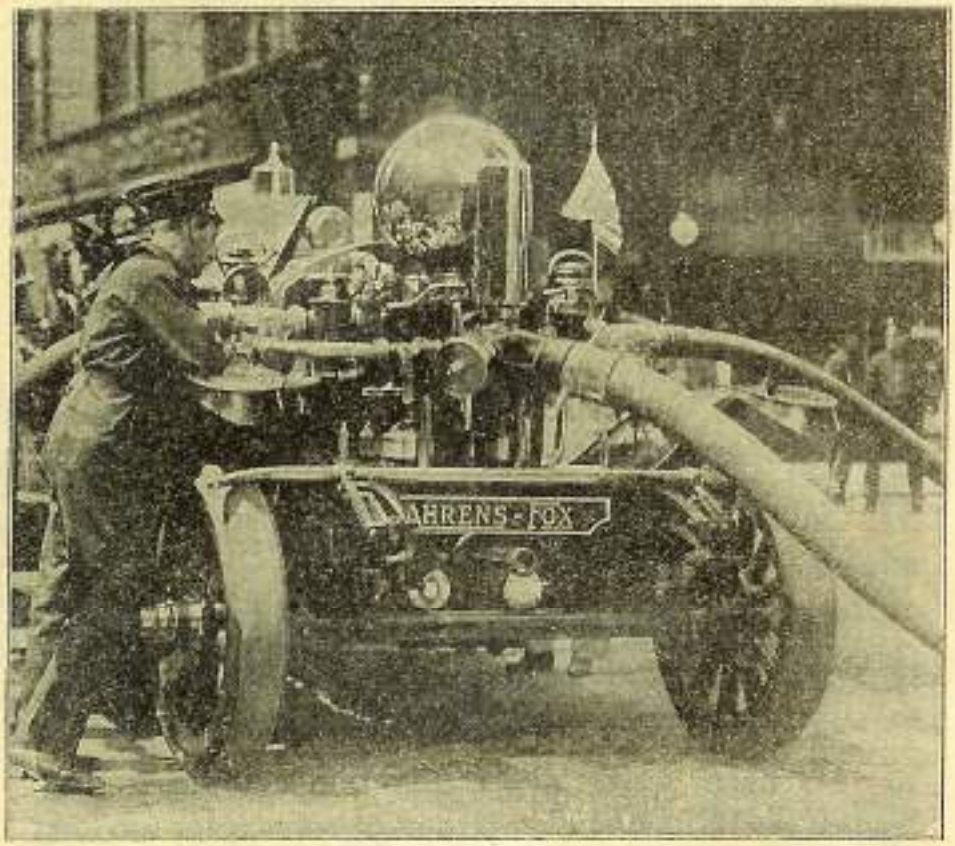
Note: The two systems of Ignition cannot be synchronized, therefore the customary practice is to switch off "B" when the magneto is in service.

To keep spark plugs from fouling, the Battery System should not be kept out of service for too long periods.

Practice Drill

Condition of the Apparatus and its ability to function properly should never be permitted to become a a matter of doubt.

Starting cold and during the period that an engine is warming up to its normal working temperature there is an unavoidable tendency to crank case dilution. It is not advisable therefore to start the motor unnecessarily.



IN ACTION—

Consider where the water is coming from and where it is to go.

The operators station is forward, where all things concerned with the management of the Pumps and the Motor are in full view and most conveniently accessible.

Avoid raw gasoline in cylinders by using the Carburetor Choker sparingly.

Excessive drain on storage battery can be avoided by "hand-cranking" engine in practice drill.

38. *Oil Pressure:* Gauges are provided for indicating the force feed pressure of the lubricating systems, viz:

Gauge on dash, for the engine unit.

Gauge on front of the pump drive unit.

The two oiling systems are separate and gauges should be read from time to time to learn if the pressures are properly sustained.

Engaging the Pumps

During Practice Drills, when the engine is started, it is customary also to set the pumps in motion for a brief spell.

This must not be done however unless the pumps contain some water. See *Hint 20.*

Before starting the pumps—in quarters—the by-pass or churn valve must be open. See *Hint 24.*

The suggestions—heretofore expressed—having been complied with, the pumps can be put into action observing the following precaution always.

39. *Before engaging Pumps*: engine must be slowed down to idling speed. See Hint 68.

Before disengaging clutches, relieve pump of water pressure. See Hint No. 72.

40. *To stop the Engine,* after practice drills, or otherwise, switch off all ignition. See *Hint 10* and avoid unnecessary waste of electric current.

41. *Battery:* Too frequent use of the Electric Starter without corresponding running of the engine to restore the current thus absorbed will result in a spent battery and consequent failure of the device to perform its function.

The condition of the battery is best revealed by hydrometer readings—taken according to the method which is now generally understood.

If the Battery is too badly run down, or if it is undesirable to run the engine long enough to recharge, then, recourse must be taken to charging from some outside source.

42. *Hand Cranking* saves battery current. In practice this should be done often enough to establish confidence in this method of starting the engine.

Never overlook retarding the spark when starting the engine, this applies equally to the self-starter or when cranking by hand.

Getting Away

Reverting to *Hint 32* and going through to *Hint 37*—assume now, that instead of a Practice Drill, the apparatus is to respond to a call.

The driver is seated at the steering wheel and the engine running at idling speed. The next moves occur in about the following order.

43. *Emergency Brake:* release before attempting to start the car.

44. *Driving Clutch:* left pedal—release by pushing forward. Allow brief interval for clutch brake to arrest spinning of drive shaft.

45. *Gear Shift:* To go forward—holding out on clutch pedal, bring the gear shift lever to "low gear" position.

Let the clutch in slowly.

Accelerate the engine speed—beginners preferably should use the hand throttle. Avoid racing the engine.

The machine will begin to roll as the clutch picks up the load and proficiency of the driver is evidenced by the smoothness of the "get-away."

46. *Steering:* Begins the moment the machine starts on its way and, the further successive gear shifts, closely follow the routine as ordinarily practiced in the driving of motor vehicles similarly equipped with "selective type of transmission"—with three speeds forward and single gear for "Reverse."

47. *Go Slowly:* Novices particularly must not attempt "speed" until after acquiring the "swing of the wheel" which is essential especially in gauging of turns.

48. *Avoid Riding the Clutch:* Acquire the habit of keeping foot off clutch pedal except at such times that the clutch is to be manipulated.

Ahrens-Fox Disc-Type Clutches are sensitive. Little pressure is required to effect complete disengagement; the weight of the foot on the pedal may be unconsciously causing the clutch to slip; continued slipping develops heat and the practice is detrimental to the life of the parts.

49. *Cold Engine:* do not expect the best results too quickly.

Give the Engine a chance to warm up.

Motor Apparatus is often needlessly exposed to cold drafts.

Starting and speed in "getting away" is largely a matter of keeping the engine warm.

50. *Hand and Foot Throttles:* over rough roads or in case of the novice, the hand throttle affords steadier action.

Proficient drivers usually prefer the foot throttle and beginners should aim to acquire the knack.

Using the foot throttle to unnecessarily race the engine is an abuse.

When the hand throttle is open, do not overlook closing same when throwing off the load; otherwise the engine will race.

51. *To Stop:* throw both feet forward on the pedals.

The left pedal disengages the clutch—cutting off the power from the road driving mechanism. The right pedal applies one set of brakes.

52. *About driving Ahrens-Fox Motor Apparatus*:

In proportion to their weight, etc., Ahrens-Fox machines are equipped with very powerful motors. Drivers, therefore, should use good judgment in operating the apparatus, so that at no time, the excessive power available may be applied to the detriment of the mechanical elements involved.

It is almost impossible to "stall the motors" in the manner that this occurs in the more ordinary forms of automobiles, hence, it is unnecessary to "speed" or race the engine when picking up the load represented by the vahicle.

53. *Slow Down for Turns*: this is a cardinal requirement.

There is no rule that covers the case better than the broad hint to go slow enough to get around safely.

Stops should be anticipated insofar as this may be possible and road speed is to be gauged at all times according to the idea of "Safety First" and thus successfully coping with all contingencies.

54. *Arriving at the Fire*: after the commanding officer indicates the source of water supply, the driver should set the apparatus as nearly level as circumstances will permit.

Drivers can also assist in more conveniently reaching the water, by manipulating the apparatus to the advantage of the firemen who are making the necessary suction hose attachments.

When definitely placed, the Emergency Brakes should be set and for additional security the chock blocks placed where same will be of most avail.

55. *Slow down Engine*: to a very slow idling speed, before leaving the seat. This puts engine in condition to apply power to the pumps, the clutches for which should never be engaged when the engine is running at high speed.

56. *Gear Shift Lock*: this should be applied without delay so that the road driving gears may not accidentally be engaged after the apparatus is stationed.

57. **Caution:** At this stage and although surrounded by conditions of excitement, the operator must remain cool, collected and deliberate.

58. *Starting the Water:* This cannot be done until the pumps are properly connected up to the source of supply and in this particular conditions may vary considerably.

59. *If water is to be Drafted*: use the hard, smooth bore suction hose, usually the two lengths carried on the apparatus must be coupled together and always attach the perforated strainer to the end entering the water.

60. *When drafting Water*: all connections must positively be air-tight and the strainer submerged sufficiently to avoid taking in air.

Remember that no water can be passed through the leading hose when drafting—until the pumps are actually put into action. On the other hand, when attached to a hydrant, the water can be passed through the pump by the hydrant pressure—even though the pumps are at rest.

61. *Supply from Hydrant*: connection to pump is usually made with what is known as a "soft suction" having swivel screw connections—one end coupling to the suction inlet of the pump and the other to the hydrant.

Should the soft suction fail or, where none such is available, the hard suctions can be used instead by attaching a suitable adapter—made to fit the hydrant thread.

62. *Leading Hose*: by which water is conveyed to the fire is coupled directly to the discharge gates of the pump. The number of gates for the purpose is never less than two and the larger capacity fire engines may have four.

63. *Before starting the Pumps*: the operator should by actual survey, satisfy himself that all connections have been properly made. **Stop! Consider.** Where the water is coming from and where is it to go?

64. EXPLANATORY

Ahrens-Fox Fire Engines of the models now current have a single fire pump which is so arranged that not all of the working pistons must necessarily be in operation at the same time.

Thus in four cylinder pumps, either two or all four pistons may be put into motion.

In six cylinder pumps, either three or all six pistons may be operated as desired.

This arrangement is equivalent to the low and high gear road driving mechanism, for obviously at the same motor speed and with the full pump working, the maximum volume of water can be passed.

In actual practice however, it frequently is necessary to utilize the power of the engine so that maximum discharge pressure may be realized, and upon the same principle that speed is sacrificed in driving an automobile up a steep hill by going into a lower gear, so is volume of discharge lessened—by leaving one section of the pump idle—so that higher pressure may be gained to overcome the greater resistance encountered in some fire-fighting situations.

With some few exceptions, the bore of the pumps to the right of the machine are somewhat smaller than the bores at the left, and in consequence it follows that the side with the lesser piston areas is capable of working at the highest pressures. The other side will move a somewhat larger volume of water, but at not quite so high pressure.

It will be noted from these explanations, that the operator must practice discernment—working the pumps in the way best calculated and adapted to the particular conditions imposed.

65. *Working Pump Pressures*: When the pressure is to exceed approximately 140 pounds per square inch —as read from the pressure gauge on the discharge side of the pumps—do not attempt such work with both divisions of the pump in action.

It is impracticable to deliver the full rated pumping capacity of, say 750 gallons per minute, through one lead of ordinary fire hose, and therefore, when only one line of hose is attached, the operator should preferably engage one division of the pump only.

Unless especially ordered by a commanding officer, better results will follow, with moderate pressures —say about 120 pounds at the outset, and which need not be increased until greater pressure is ordered.

66. *By Pass or "Churn" Valve*: this must be closed before attempting to draft water.

When the Churn Valve is closed be sure that some other Discharge Port is open, otherwise with the pump in action the pressure will rise and seek relief at the safety pop valve.

67. *Air Valves:* on pump—must be opened when first starting the pumps. Air will be expelled and when the water follows solidly, the valves should immediately be closed.

68. *Engaging the Pumps:* the clutch levers—forward—on the pump drive case, are operated by first depressing the button at the top end of the handle and then swinging the lever towards the rear of the machine.

Engine should be idling slowly when the pumps are put into engagement and also be sure you have provided an outlet for the water.

69. *When Drafting,* and the pumps are once filled, the pumps need not be disengaged when the discharge must temporarily be stopped.

First open the Churn Valve, slow down engine and gradually close the Discharge Gate all the while noting the pressure gauge which will serve as a guide to these movements.

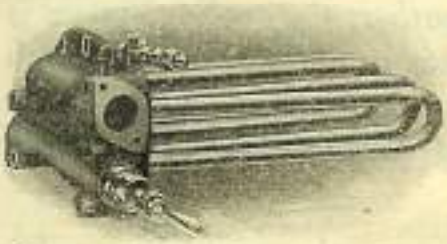
70. *Use Hand Throttle*—forward of radiator for controlling Speed while engaged in pumping. Do not jerk the throttle open or shut—always build up pressures gradually and should there appear a tendency to stall, relieve at the churn valve.

71. *When fire hose is laid out* kinks may obstruct the flow of the water—the operator therefore must "feel his way" i. e., apply the pressure gradually—depending on the churn valve to keep the pumps going in case the obstruction does not yield to the force applied.

72. *Disengaging Pump Clutches:* Slow down engine and relieve water pressure.

These clutches are of the positive type and will not let go readily when under heavy load.

73. *Auxiliary Cooling System:* when engaged in pumping, the Radiator, etc., may be unable to cope with the heat developed.



Junction Box with Circulating Loops

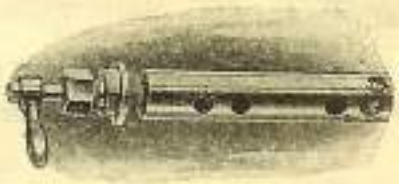
While the Radiator can be fed with water taken directly from the Fire Pumps, it will be found however that the Auxiliary Cooling System in most instances is well able to dissipate all excess heat developed by the engine.

Temperature of the water in the radiator may be observed from the "Motometer" which is attached to the filling cap.

As soon as temperature advances above normal proceed to "cut in" the regulating valve—manipulated by a handle—which appears at the right and rear of the pump body.

The effect of "cutting in" as here described, is to divert the hot water coming from the engine cylinder jackets through a series of thin copper coils housed within the suction chamber of the pump.

These cooling coils are submerged, and the rapid flow of the water—passing through the pump—speedily absorbs the heat, and the water thus preceptibly cooled flows back into the radiator and resumes its course through the cooling system of the engine.



The Regulating Sleeve

74. *In extremely cold weather,* the cooling system is "cut in" while the apparatus is enroute to a fire and obviously, at such times, the cooler performs the functions of a heater—tending to keep the pump warm and thus prevents freezing.

Under ordinary conditions the regulating valve of the cooler should be kept in its "off" position.

75. *Alertness to Duty:* While the pumps are in operation, the attendant must be keenly observant of all points concerned with the welfare of the apparatus.

All parts are working at high tension; the importance of maintaining correct lubrication must continue to claim attention and there is neither time nor place for anything but the most intense application to the business at hand.

76. *Returning to Quarters:* In taking up—after working at a fire—care must be taken to collect all implements belonging to the apparatus.

Immediately, replenish lubrication wherever necessary.

Fill the fuel tank, radiator, grease cups, etc., and in short, go over the ground as set forth in the earlier hints comprising this set of suggestions.

In addition; make a careful examination of the entire apparatus with a view of locating loose screws, bolts, nuts, and the like. Should defects be apparent which cannot be properly cared for otherwise, the facts should be immediately reported.

77. Operators should realize that the fire fighting apparatus can be depended upon only when maintained in a way compatible to coping with the most protracted hardships incident to the Service.

78. *Steering Gear*: after each run, this should be made the subject of special observation.

79. The entire apparatus should always be thoroughly well cleaned, so that no defects may remain hidden under accumulations of dirt.

80. Important—Oil and Grease Cups.

Front Axle—6	grease cups.	Front Springs—6	grease cups.
Rear Axle—4	Do.	Rear Springs—8	Do.
Radius Rods—6	Do.	Steering Gear—2	Do.
Circulating Pumps—2	Do.	Clutch Release 1	Do.
Speedometer—1	Do.	Delco Generator—2	Do.
Fan—1 Oil Hole.		Magneto—2 Oil Holes.	
Distributor—2	Do.	Gear Shift—1	Do.
Clutch Shift—5	Do.		

Other points can also be found where the use of lubricants will be of advantage. The above are the most important.

81. **Caution:** Avoid excessive use of oil on all electrical devices.

82. **General Hints:** Do not attempt to start the engine, until thoroughly fortified with such knowledge as must first be acquired in order to do so safely.

Take nothing for granted. Study the suggestions as they have been outlined hereinbefore and overlook nothing.

Familiarize yourself thoroughly with the routine and be prepared to make each successive move correctly and without apparent hesitation.

Earlier experience with Automobiles is desirable but does not warrant ignoring the instructions herewith imparted.

Acquire a general understanding of the apparatus as a whole; strive to know more than appears on the surface and this more intimate acquaintance with the interior of things can only be gained by study and application.

83. Ahrens-Fox Booster Equipment:

This attachment, as applied to the ordinary form of Pump and Hose Cars is intended as a substitute for fighting such smaller fires as would yield to streams supplied by chemical engines.

84. The Elements comprise:

First, a fresh water tank of about 60 gallons capacity, generally mounted over the hose body.

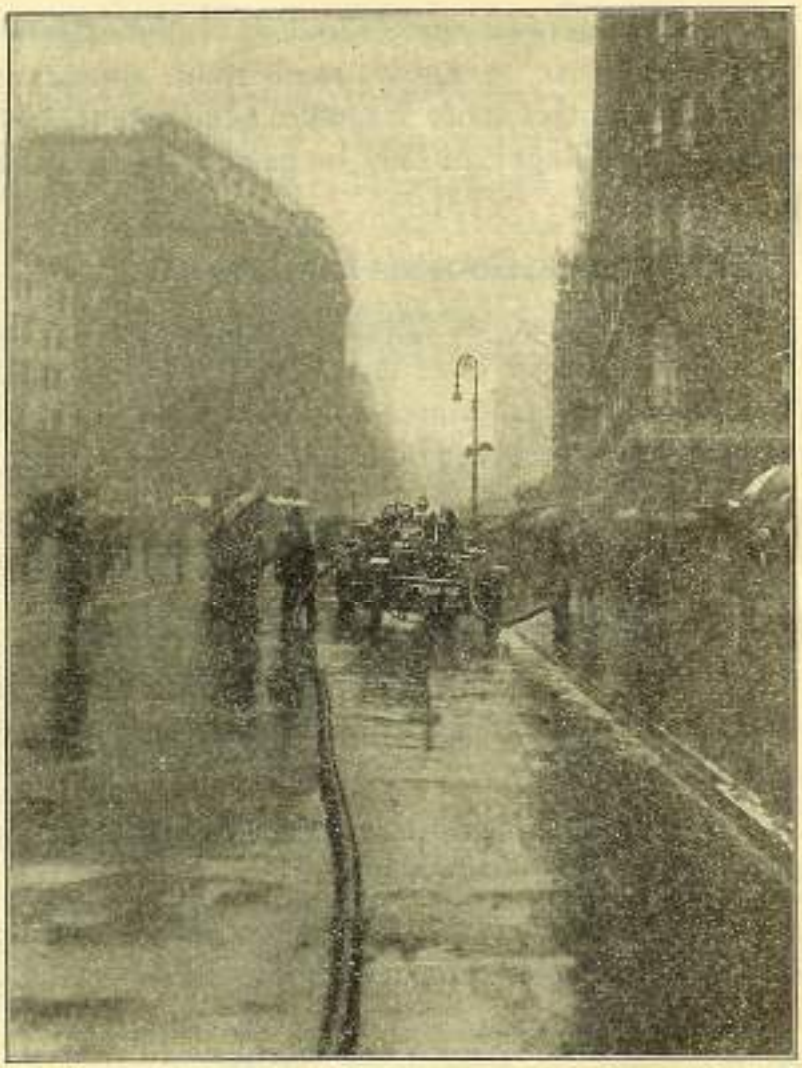
Second, a hose reel, also mounted on the apparatus and upon which is carried 200 feet of chemical engine hose.

Outer end of the hose carries a "shut off" nozzle—with a tip of about ⅜-inch bore.

The inner end of the hose is coupled to the hollow axle of the reel upon which the hose is wound.

Hose reel is connected with the discharge side of the fire pump and the passage of water therefrom is controlled by a valve at the right side of the pumping unit—forward.

The tank is piped to drain into the suction chamber of the fire pump and suitable valves are provided, on the left side of apparatus, for controlling the flow.



Weather Conditions—must be accepted as they happen to be. Not always pleasant, yet for many years AHRENS-FOX ENGINES have successfully overcome the most adverse situations.

85. **In Action:** the apparatus is brought close to the place of the fire. The small hose is run directly to the scene of operations. The operator opens the flow valves from the Tank—also opening valve to permit discharge to hose reel. At the same time, with the By Pass or Churn Valve open, and all other outlets closed, one division of the pump only is thrown into action.

The pumps are run very slowly and the churn valve is regulated so that about 80 to 100 pounds pressure is registered and no more is to be carried unless especially ordered.

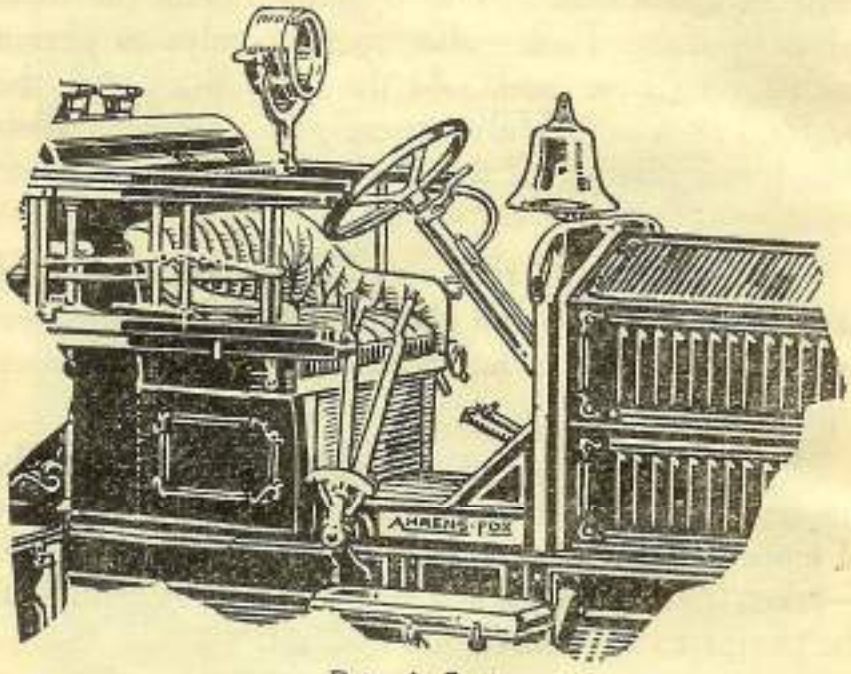
If the nozzle is constantly open, the tank may be emptied in less than five minutes and in anticipation of more water being needed, a line of 2½-inch hose —taken from the apparatus—is immediately laid, from the pumps to the nearest fire hydrant.

Provision is made for coupling this hose line to the suction inlet of the pump and the proper screw reducers and fittings are also carried for making the hose attachment to the fire hydrant.

Water being turned on at the hydrant, the gate, attached to the suction inlet of the pump is opened and thus set up, the work of the Booster may be maintained indefinitely.

As the flow starts from the hydrant, the water backs up and refills the Tank, which soon overflows and when this occurs, the valve in the tank suction pipe should immediately be closed.

CONTROL



Driver's Station

RIGHT HAND DRIVE—Standard gear shift with lever at right of the driver. Emergency brake lever adjoins on the outside. Service brake pedal at right. Clutch pedal at left. Gas pedal on toe board. Spark and throttle levers at steering wheel. Gas adjusters on steering post. Speedometer, Odometer, oil pressure gauge together with ammeter and other electrical controls are mounted on the dash.

Lubrication

Assuming that all parts are properly assembled and adjusted, that first duty of an operator is to see that all working parts are supplied with lubricants.

The successful operation of any motor vehicle demands constant lubrication. Thoroughness is essential; the oiling of parts must be done faithfully and the work requires fidelity and intelligent attention.

Lubrication in correct degree must ultimately be gauged by actual service demands, and, as no two motor vehicles are ever operated under exactly similar conditions, it evidently is impracticable to lay down exact and inflexible rules to govern proper oiling.

Satisfactory lubrication always involves frequent observations and the consideration of at least four cardinal points, viz:

1. To know definitely where the lubricant is to be applied.
2. Determination of the kind of lubricant best adapted to each situation.
3. The least quantity that can be applied for effective results.
4. Frequency of applications to insure constant lubrication.

It is equally important that all oils, greases, packing and the like, should be kept in tight containers, thereby keeping the contents fresh and free from dust and grit. Moreover, a certain degree of cleanliness must be observed and neatness should attend all oiling operation.

Oil holes are to be kept free from dirt; channels for conveying lubricants must not be allowed to become clogged and it is especially important to wipe away all grit before the various cups are opened up for re-filling. It is equally excellent practice to filter all oils thru a fine wire gauze strainer before pouring same into the crank cases.

Generally, frequent oilings and lesser quantities are more effective than heroic doses of lubricants applied at wider intervals. In no event should oiling be done in hap-hazard or aimless fashion. To the contrary the attendant must practice great care, not merely applying the lubricating substance, but he should also observe that it reaches the parts for which it is intended.

The best lubricants—used judiciously—are the most effective and both the hazard and the cost is less than when cheaper grades are applied recklessly and in a wasteful manner.

Avoid using cotton waste; clean rags, free from lint are preferable for cleaning and wiping off superfluous oil and grease.

It is not intended that these instructions shall enumerate all points where lubricants may be applied to advantage. The chief elements are to be treated as follows:

Engine Crank Case. Use a medium to heavy motor oil of very best grade obtainable. Fill through breather tube attached to crank case until float indicator rises to about ¾-inch from top of oil gauge. Always aim to carry oil as high as this can be done without causing a smoky exhaust.

An oil level try cock is attached to the engine oil pan. Oil supply need not be carried higher or should it be permitted to fall much below the point thus indicated. The accuracy of the oil gauge can always be ascertained by using the try cock and it is advisable to make comparisons frequently to determine the reliability of the readings shown by the float gauge pointer.

Other Items Demanding Lubrication.— Operators should search out all moving parts and will be expected to exercise their own judgment as to oiling in such instances where specific directions are omitted. Grease cups should be kept filled and screwed down as usage demands.

Transmission Gear Case.—This is properly charged at the factory; additional lubricant of approximately the same kind is to be added from time to time. Fill through cover plates attached to top of the gear case; always keep the case about half full and at periods of from six to twelve months—according to service—the contents should be completely removed. Wash out the entire interior with gasoline; drain and dry out thoroughly; before refilling; examine all gears and bearings.

Caution.—The excessive use of oil on all electrical apparatus must be avoided. Oil is destructive to rubber insulation and unless used sparingly on Magneto, Motor Generator and other devices concerned with the Ignition, Cranking and Lighting Systems, the efficiency of these vital and essential elements may be quickly nullified.

Neither are the oiling of these devices to be neglected. The supply must be gauged by drops—one or two at a time—and applied with due consideration as to the period of actual operation.

Roller Bearings.—Bearings of the roller type are used in the following places: Front wheels—including steering knuckle heads. Rear wheels—and in the transmission.

We especially urge before attempting to operate an Ahrens-Fox Motor Pumping Engine a careful perusal of these instructions. An examination of the machine is also advised and, if the spirit of our directions with respect to lubrication is carried out in the preliminary, a fair understanding will have been gained as to how to proceed with the apparatus.

Effective lubrication is essential to proper maintenance.

General Directions

To be observed after all lubrication has received attention.

Radiator.—Fill the radiator with clean fresh water and see that the entire cooling system is properly filled.

It is necessary—subsequently to see that the radiator is kept fully charged with water.

Fan.—Examine the fan belt and driving mechanism, which must always be maintained in first class working condition.

Pump Crank Case.—Differing from the gasoline motor, the temperature of the mechanism concerned with the fire pump drive is always very much lower. For the same reason, the supply of oil is more lasting.

The float indicator is omitted on pump drive; fill through the breather tube attached to the crank case until oil appears at the upper try cock and always replenish before the oil falls to the level of the lower cock.

Forced Circulation of Oil.—After filling the oil pans to the proper levels, lubrication of both the engine and the pump mechanism is automatic, but does not necessarily depend on splash. The oil is kept in positive circulation, under pressure, by gear driven pumps and while the principle and general features are similar it must be understood that there is no connection between the two. The systems for the engine and pump are separate and each is complete in itself.

The oil pressures carried are shown by gauges, viz:

For the engine—by gauge attached to the dash.

For the pump—by gauge attached to front on oil pan.

Oil is forced directly into all main bearings at the pressures shown by the gauges and the readings thus shown are evidence that the systems are properly performing their functions.

When shipped from the factory, tags are always attached to some part of the oil pump appearing on the outside. These tags show a cut of the oil pump and carry the following notice:

Important—Read and Observe Carefully

Oil Pump, detached

Oil Pump is of the gear type and is flanged to the crank case. This pump should be taken down and cleaned at frequent intervals, especially while the machine is new. First drain the case; remove the cap screws, and withdraw the pump as illustrated. Filter screen (of fine mesh wire) must be kept free from obstructions. Rinse in gasoline; avoid using cotton waste or lint on interior parts. Use good, clean oil only and renew when the appearance of the old oil indicates the need.

Crank Cases and Oil Pans together with Oil Pump must be Kept Clean.—The above requirement is imperative. Frequency of cleaning cannot follow any predetermined rule as to time. The operator must be the judge as this depends upon various circumstances attending and the kind of oil used.

Obviously, the engine will require more attention than the pump and by reasons of improper fuel and faulty carburetion; operators are particularly warned against destructive accumulations of water and gasoline in mixture with the oil contained in the engine crank case.

Auxiliary Cooler.—Before starting; when running without fire pumps in service, keep the regulating valve set in its off position.

This device is to be brought into action only when engaged in pumping—when it should be gauged to meet the extra cooling requirements. The only exception to the above rule relates to service in cold climates, where the auxiliary is used to keep the fire pumps from freezing while enroute or standing by.

Radiator Feed Valve—on right side of pump, should be kept closed and used only to replenish the water in the engine cooling system.

Do not use this if water handled by the fire pumps is unfit to enter the cooling system.

In exceptional cases of high temperature, and when the water supply for the fire pumps is clean, the auxiliary feed value may be used to flood the cooling system. Ordinarily however, the auxiliary cooling system is ample to keep the engine temperature normal.

Fire Pumps.—The controlling clutches should be kept in "off" position until ready to put the fire pumps in action.

It is desirable to flush the pumps by connecting to hydrant. This refers only to getting the engine ready upon arrival at destination, because pumps always are drained before shipment and the leather pump buckets may have dried out and the rubber valves become sealed to their seats.

After this initial flushing and at all times thereafter, it is preferable not to drain the pumps completely. Any water remaining therein after the suction hose is taken off should be left in the pumps.

Ignition and other Electric Appliances. — With storage battery charged and connected—next examine all wiring. Go over all connections; see that none have come loose in transit and that current traverses the conductors in a manner which will satisfy the requirements of ignition.

At the same time, and in this line includes investigations of the electrical cranking—generating and lighting systems which is incorporated with the battery ignition.

Also examine the wiring and connections associated with the magneto—keeping in mind however the fact, that the magneto system is absolutely complete in itself and wholly independent of the battery system.

Ahrens-Fox engines may be started and operated on either the battery or the magneto system.

The accepted practice is to start the engine on the battery and after starting, shift over to the magneto.

The magneto is usually of the single spark type, firing the plugs placed over the intake valves.

The battery is a single spark ignition with plugs entering at the side of the cylinders in close proximity to the intake valves.

There is no advantage in operating both the battery and the magneto systems of ignition at one and the same time.

Caution.—When starting, either with electrical starting device or cranking the engine by hand, *it is absolutely essential to retard the spark when using the battery ignition.*

Serious personal injuries may follow an attempt to crank the engine by hand if this warning is disobeyed, and neglect in this same particular will result in serious damage to the engine and parts associated if the electrical starting device is engaged with the battery ignition in the advanced position.

Battery Ignition is "on," when the switch button marked "B" is pulled out.

Magneto Ignition is "on," when the switch button marked "M" is pulled out.

When engine is not running, both Battery and Magneto Ignition Switches should be in off position. Neglecting to do this will weaken the storage battery needlessly.

Ammeter.—The charging and discharging rates may be observed on the dial of the instrument attached to the electrical control switch located on the dash.

Electrical Devices.—Overcharging of the battery is defeated by the regulating device housed inside the aluminum case fastened on the dash. (Delco System.)

While the batteries cannot be overcharged, it is possible however, to exhaust the cells by using the starter too freely and under conditions which will not permit generation of sufficient current to repay the battery.

When the engine does not respond promptly to the cranking efforts of the starting motor, the fault is elsewhere and it is important therefore to keep both the ignition and the carburetor in condition to function properly.

Current is not to be unnecessarily wasted by the needless burning of lights, and unless facilities are available for charging the battery from an outside source, the engine must be permitted to run sufficiently long, after each start, so that the power of the battery will be fully maintained.

Lighting.—The electric wiring and connections should be examined frequently. The lamps are controlled by the several other switches appearing on the dash.

Fuel Tank.—Gasoline of the highest gravity obtainable should be used. Fill the tank, through the spud. It is desirable to always filter the fuel and all ordinary precautions concerned with the handling of gasoline safely are to be observed.

When filling the tank, thoroughly examine all connections and see that the fuel flows to the carburetor; also look for leaks which may occur incident to usage.

When Ready to Start.—In the absence of an experienced demonstrator, no novice should try to start the engine until he has digested the information hereinbefore conveyed and has carried out the preliminaries already brought to notice.

Assuming that all previous instructions have been faithfully observed, the apparatus is then in condition to be started.

The following resume is a check on the procedure:

Oil in crank cases.
Transmission filled with lubricant.
All parts clean and properly oiled.
Cooling system filled with water.
Radiator feed valve closed.
Auxiliary cooler in off position.
Fire Pump primed and in order.
Fire Pump strainer clean.
Fire Pump clutches disengaged.
Fire Pump by-pass open.
Fire Pump air cocks closed.
Fire Pump discharge gates closed.
Fire Pump relief valve closed.
Fire Pump throttle (forward) closed.
Storage Battery—active.
Electric switches—in off position.
Ammeter—registering zero.
Lights—in burning order.

FINALLY BE WARNED

¶It is unreasonable to expect normal results from a cold engine.

¶Undue forcing, before cylinders are warmed up will cause crank case dilution.

¶This is especially so, if the carburetor adjustment is rich or the chokes are used injudiciously.

¶Expedite "getting away" by keeping the Apparatus warmly housed and never start the Motor unnecessarily.

¶Keep foot off Clutch Pedal when driving. Do not release the Clutch except for the purpose of shifting gears.

POSITIVELY AVOID "COASTING"

Don't Blame the Builders if you won't heed the following:

¶When under headway—on the road—and gas throttles are closed, the momentum acquired by the Apparatus is driving the Engine instead of the Engine driving the Apparatus.

¶If the Clutch is released at such times, the Engine slows down or may come to a dead stop. AND THEN, if the Clutch is "let in," without first accelerating speed of the Engine, something more or less disastrous is likely to happen.

¶Broken Timing Gears, Cam Shafts, Crank Shafts together with twisted Drive Shafts and ruptured Transmissions are more directly chargeable to "shocks" imparted by the Force stored up in a moving vehicle, than by any Force which can be developed directly in the Engine itself.

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