the summer hot weather load, or for an extended fire demand, was insufficient. Three of the wells were therefore connected with an air-lift system arranged to discharge into the reservoir, using the suction piping as a gravity flow line.

A suitable arrangement of valves is provided to permit this flow from the wells to the reservoir, while the service pumps draw their supply from the reservoir by suction. By this arrangement, the water supply was more than doubled from these three wells.

One of the 8-in. wells had a natural artesian flow of about 150 gals. per min. When under suction from the pumps, the pull-down was 20 ft., increasing the flow to 500 gals. per min. When this well was connected up for operation under the air-lift, its production was increased to 1,035 gals. per min., the pumping head being 50 ft. below the surface. The other two wells, connected up in the same manner, showed a proportionate increase.

These wells are handled by means of an air-lift pump suspended on a 2-in. air line in the 8-in. casing. The air for operating the wells is supplied by a straight-line simple steam and compound air compressor, size 14 by 16 by 10 by 16 ins., having a capacity of 558 cu. ft. of free air per min. The installation was effected in a simple and economical manner, piping the air from the receiver to and into the wells. On ordinary service, the pumps secure sufficient supply by direct suction. When an increase is demanded by the summer domestic requirements or by fire, it is merely necessary to start the compressor, throw a few valves, and the supply from the wells is more than doubled.

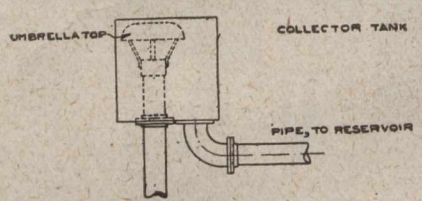
For general information I include below some figures secured from two installations made at Galesburg, Ill. The first of these has been in operation over a year, and the second about six months. These plants are located at different points in the town and centrifugal pumps used to take the water from the service reservoirs and force it directly into the mains. You will notice that the efficiency indicated in these reports is the electric in-put to the motor as compared to footpounds of work done, and includes all motor, transmission and compressor losses, and we believe will compare favorably with the highest type of mechanical pump under the severe lifts obtaining at these installations.

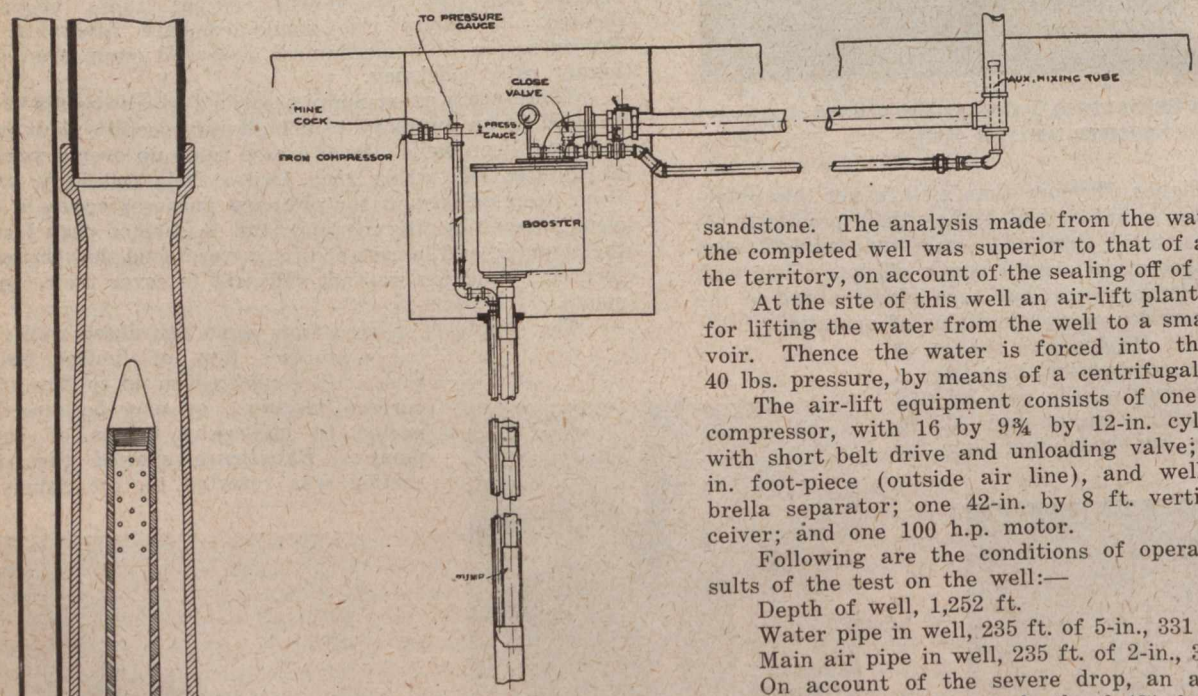
The city of Galesburg, Ill., has had considerable difficulty in securing sufficient water for the public supply. A number of wells in the neighborhood of the old pumping plant have been driven and equipped with various devices, but failed to give the amount of water needed. The old plant consists of three deep and six shallow wells, with a combined yield of about 250 gals. per min., and has been very expensive to operate and maintain, and it was therefore determined to sink a new well.

The construction of this well was as follows: 40 ft. of 24-in. heavy steel casing; 106 ft. of 20-in.; 130 ft. of 16-in.; and 350 ft. of 12-in. steel casing. The 12-in. is sealed in the rock. The hole was then drilled 12 ins. in diameter to a depth of 1,085 ft. from the surface, then reduced to 10 ins. and drilled down to 1,255 ft. through the St. Peter's sandstone formation.

The well was then shot with two 200-lb. charges of 100% gelatin, covering the entire sand rock strata, and carefully cleaned out.

Genuine wrought-iron 10-in. pipe was installed and sealed into the top of the 12-in. pipe, approximately 350 ft. from the surface of the ground. This extends to within 3 ft. of the top of the sandstone strata, hermetically sealing the well from all water in the strata above the St. Peter's sandstone. The analysis made from the water secured from the completed well was superior to that of all other wells in the territory, on account of the sealing off of the upper strata.





AT THE LEFT,—AIR LIFT PUMP; ABOVE,—TYPICAL ARRANGEMENT OF AIR-LIFT, INCLUDING PUMP, BOOSTER, ELEVATED TANK AND COMPOUND LIFT

At the site of this well an air-lift plant was constructed for lifting the water from the well to a small surface reservoir. Thence the water is forced into the mains against 40 lbs. pressure, by means of a centrifugal pump.

The air-lift equipment consists of one angle-compound compressor, with 16 by 9¾ by 12-in. cylinders, arranged with short belt drive and unloading valve; one standard 5-in. foot-piece (outside air line), and well-head with umbrella separator; one 42-in. by 8 ft. vertical steel air receiver; and one 100 h.p. motor.

Following are the conditions of operation and the results of the test on the well:—

Depth of well, 1,252 ft.

Water pipe in well, 235 ft. of 5-in., 331 ft. of 6-in.

Main air pipe in well, 235 ft. of 2-in., 331 ft. of 2½ in.

On account of the severe drop, an auxiliary starting device was installed at a depth of 481 ft. 8 ins., to pump off the head and keep the starting pressure within the range of the compressor.

Static head (from ground)	186 ft.
Drop	118 ft.
Elevation above surface	7 ft.
Total lift	311 ft.
Operating submergence	262 ft.
Percentage of submergence	45.8
Depth of pump in well	566 ft.
Operating pressure	121 lbs.