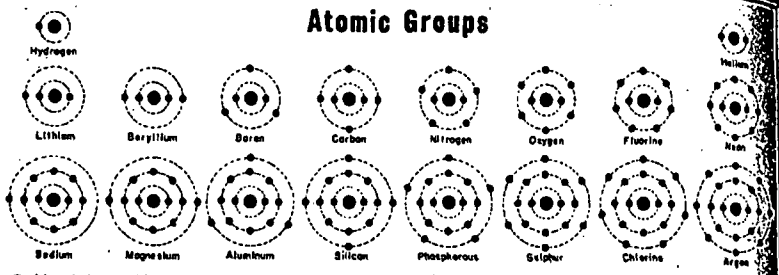
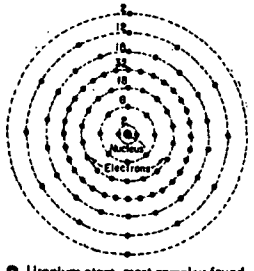
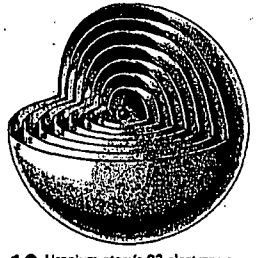
Atomic Groups



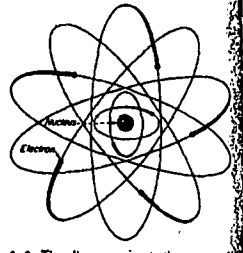
8 After helium, with two electrons in single orbit, number of electrons in second orbit increases by one for each of 8 succeeding elements: lithium, beryllium, boron, carbon, nitrogen, oxygen, fluorine, neon — an inert gas



9 Uranium atom, most complex found in nature, has 92 electrons. It is notable for its use in atom bombs



10 Uranium atom's 92 electrons are divided into seven shells as diagram shows. Ball in center is nucleus



11 The diagram shows the assumed orbits of the seven electrons that are to be found in the nitrogen atom

charge; therefore it is electrically neutral.

4. Positron is believed to weigh the same as an electron, has a positive charge equal to the negative charge of the latter.

5. Mesotron, or meson, has weight between that of proton and electron, but the same negative charge as the latter.

In dealing with electronic devices the electron is jack-of-all-trades, but we mention the other particles to get a picture of the atom's structure. Electrons, protons, neutrons and probably the other particles are arranged in fairly well-defined patterns to build the different atoms.

Hydrogen Atom. This atom has a proton that serves as a nucleus about which a single electron rotates, Fig. 1. Here we have a solar system consisting of one sun, a single proton with a positive electrical charge about which revolves a single planet—an electron with a negative electrical charge.

Atoms and electrons are so small they cannot be seen under the most powerful microscopes. The hydrogen atom, smallest and lightest, has a diameter of about 4 billionths of an inch. But the electron's diameter is only about one-hundred-thousandths part of the atom's diameter. Compared to their dimensions, space is very great between electrons, and between them and the nucleus about which they revolve. Fig. 2. shows Sir Ernest Rutherford's conception of the hydrogen atom. According to this famous English physicist, if we imagine the electron enlarged to 30-ft diameter, it would be 300 miles from its proton, which would be the size of a pea.

At ordinary temperatures the hydrogen atom's electron has a velocity of about 75 mi per sec in the orbit around its proton. The proton with its plus charge attracts the electron with its equal, negative charge so that they tend to fall together just as the earth tends to fall into the sun from gravitational pull. Because of their velocity, however, both earth and electron tend to fly out into space but are held in their orbits by the attraction between them and their sun or proton.

As we will see later, increasing the energy of electrons by heat, light or radiation causes them to accelerate in their orbits until some fly out into space. Thus, electrons may reach speeds that approach that of light.

Practically the total mass of the atom is in its nucleus. In the hydrogen atom the mass of the proton, or nucleus, is 1836 times that of the electron. Because of its comparatively great mass the proton is very dense and, therefore, small compared to the electron, Fig. 3. The proton in the hydrogen atom is only 1/2000 the size of the electron.

Isotopes. We may better understand helium, the next atom in the electron scale, if we consider the hydrogen

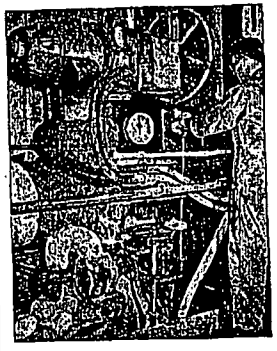
Pressure Drop Tests Take to Field

EDWARD LABORATORY FINDINGS CHECKED

Research into the characteristics of flow and the reduction of pressure drop has been a continuing Edward laboratory project for many years.

Recently Edward engineers checked their laboratory findings with a series of country-wide field tests, believed to be unparalleled in flow research, in large central stations operating under considerably different conditions.

Edward angle non-return valve as tapped for field test in 1300 lb 920 F midwestern central station.



Temporary insulation covers Edward motor-operated angle valve during in-service pressure drop tests

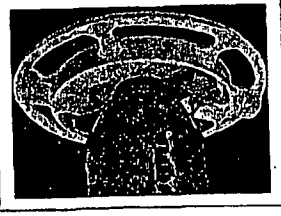
To make the tests, standard valves were drilled and tapped so that pressure recording gages could be installed at vital points in the path of flow. Stress analysis was made concurrently through strain gages affixed to the body of the valves.

Test results, coupled with laboratory data accumulated through the last decade, have guided the redesign of many types of Edward valves with reduction of pressure drop of up to 30 per cent.

IMPACTOR HANDWHEEL, CLOSURE INDICATOR AIDS TO OPERATOR

For years, the Edward Impactor handwheel has been the most popular method for manual operation of large valves. Usually attached to a valve with patented EValthrust ball bearing yoke, it has simplified closing big valves against high loads in close quarters.

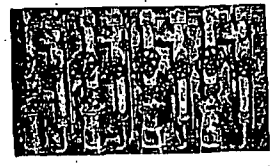
Now many large Edward valves are also equipped with a new, high-visibility closure indicator to show the position of the valve stem at a glance. In combination, the Impactor handwheel, EValthrust yoke bushing and Edward closure indicator are great helps to the operator.



Edward Fig. 2688's Used on Trap Lines

A good all-purpose forged steel globe valve is the Edward Fig. 2688, an O.S. & Y. valve, and its inside screw companion, Edward Fig. 2698.

A good example of the many piping uses for this valve series is this condensate and trap line hook-up on the



reheat system of a big new central station in north central United States.

The Edward inclined stem construction in small globe valves has many advantages, not only in lower pressure drop, but in reduced wear through freer flow, and, as the illustration shows, piping flexibility where a battery of valves must be installed in limited space.