THE HEMET IRRIGATING DAM, SOUTHERN CALIFORNIA.

A very remarkable undertaking has just been concluded in Southern California in the completion of the great Hemet dam, in Riverside County. In height it is second only to the Crystal Lake dam of the Spring Valley Water Works, near San Francisco.

Riverside is one of the most newly formed of Southern California counties, and in natural advantages of soil, climate, and productiveness, it is surpassed by none. With irrigation the growth of all temperate and some tropical plants is amazing.

The rainfall of the locality is below the average of Southern California, if anything, and is unevenly distributed, falling almost entirely in the winter months and early spring; but the mountains, which rise to an altitude of over 10,000 feet, afford storehouses of snow, which, melting during the hot season, affords an ever flowing stream of the purest water, of volume sufficient to irrigate all the productive lands of the surrounding country. The slopes of Mounts San Jacinto and Grayback, the former 10,987 feet in altitude and covered with snow the greater part of the year, provide an immense watershed whose outlet is the San Jacinto River, of which South Fork, flowing through Hemet Valley, is the largest tributary. The exact data for the whole district is wanting; but the area of the watershed of the tributary is estimated at 150 square miles.

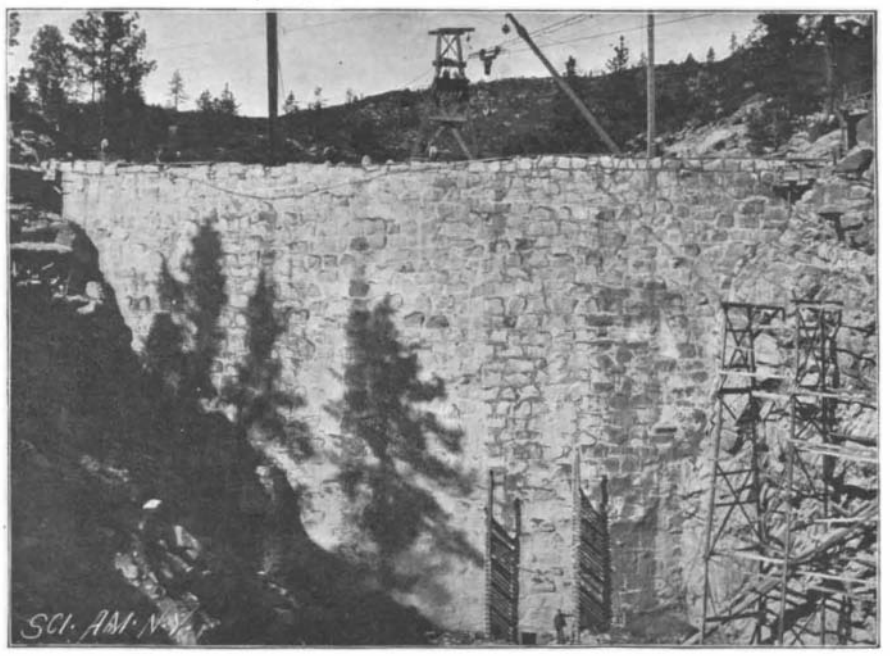
The outlet to Hemet Valley is a narrow cañon, with sides of granite, through which the stream plunges for nine miles, making a total descent, in that distance, of 2,000 feet. The altitude of the dam is 4,300 feet, and the climate at this point frosty and the country barren.

THE AQUEDUCT—IRRIGATED LANDS IN THE VALLEY BELOW.

The project of utilizing the water at this point was first broached in 1886, and plans were drawn for an impossible dam, four feet in thickness from top to bottom and curved, the convex face being upstream. It was to be constructed of cut stone laid in cement and it was to have the shortest possible radius. This plan was abandoned, and on the reorganization of the original company it was decided to first utilize the waters of the living stream to their fullest extent, and to conduct them to a tract of 7,000 acres of valley land owned by the company and over which it was proposed to distribute the water in pipes.

For this purpose a 13 inch pipe line was laid at the junction of Strawberry and South forks, and conducted 3½ miles down the cañon to the lands. The storage dam, though contemplated, was deferred for some years on account of financial reasons, until it was found that persons hesitated about acquiring lands which were supplied through a source that was regarded as a temporary expedient. On this account a storage reservoir was demanded, and work on a dam was inaugurated on the 6th of January, 1892, and carried on until floods and inclement weather compelled a suspension of construction for several months. At this time the dam had reached the 45 foot contour. Work was again resumed in 1893, and carried on without cessation until the dam had reached a height of 107 feet, but again floods interrupted, and it was not until the fall of 1895 that work was resumed, and continued with occasional interruptions until a height of 122·5 feet above the creek bed, or 135·5 feet above the lowest foundation was reached, and at this level it remains for the present, though ultimately the height will be increased to 160 feet. The site of the dam seemed specially calculated for a masonry structure because of the excellence of the bed rock foundation. There was abundance of good granite and sand right at hand, and the cañon itself was very confined.

A rock fill dam was first considered, but as the side walls of the cañon were no higher than the maximum of the height of the dam proposed, most of the rock would have had to be hoisted and transported from quarries above and below. Moreover, the volume of material to be handled would have been so much greater than for a masonry dam that there was no apparent economy in such a structure. The site chosen was inaccessible, and an expensive road with heavy grades had to be constructed, involving very great expense. The stripping of the foundations occupied several months, and a cableway was utilized for dumping water below the dam site. A "pot hole" encountered directly below the base of the dam was excavated, and several weeks were thus employed. This was filled with bowlders and gravel lightly rammed, and might have been built over with perfect safety, but it was determined to take no chances. A counter trench of irregular depth and width was cut in the rock on either side from bottom to top, as an anchorage for the masonry. Cement had to be hauled from Hemet Station, a distance of twenty-three miles and with an ascent of 3,200 feet, at a cost of $1 per barrel. A sawmill for the cutting of timber was one of the accessories, and over 1,500,000 feet were thus provided. The dam is 100 feet thick at the base and has a batter of one in ten on the water face and five in ten on the lower side. Its present crest is 260 feet long. The length at the bottom is but 40 feet. It was carried up with full profile to the height of 110 feet above base, where it is 30 feet in thickness. Here an offset of 18 feet was made and the wall reduced to a thickness of 12 feet. At the top it is 10 feet thick.

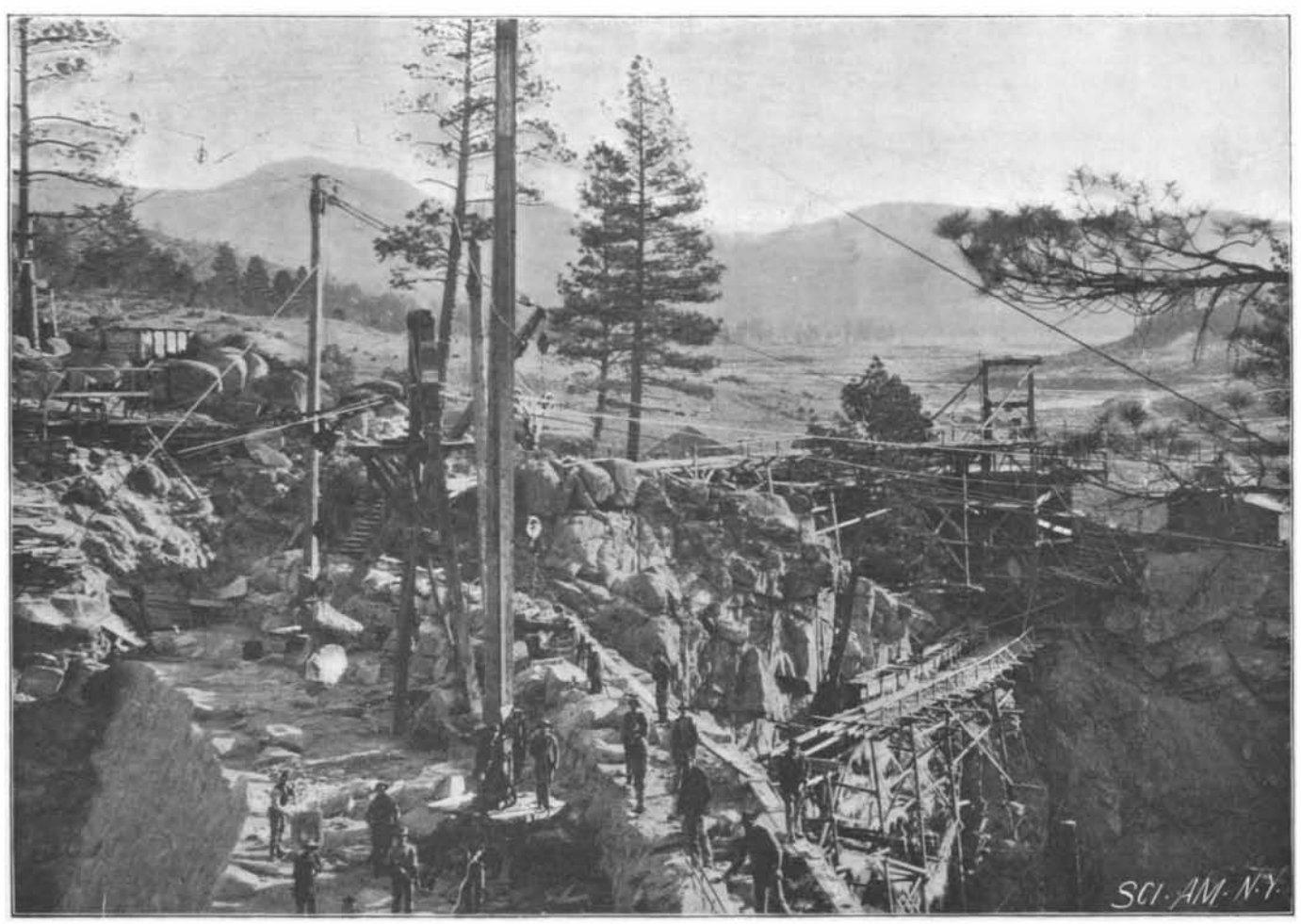


VIEW OF THE DAM FROM DOWN STREAM HEIGHT 110 FEET.

The dam is arched up stream, with a radius of 225·4 feet at the upper face on the 150 feet contour, and it is built of uncoursed rough granite rubble laid in Portland cement concrete throughout the body of the work, the faces for 3 to 4 feet in thickness being laid in cement mortar with large stones especially selected for true faces and beds. None of the stones are cut, although the facing stones were roughly scabbled. All the stones were washed clean before leaving the quarry with jets of water through a hose at considerable pressure. This washing was usually done after the stones were chained and before they were hoisted above reach.

The total cubic contents of the dam are 31,105 cubic yards, and 20,000 barrels of cement were used, which cost about $5 per barrel on the ground.

The stone was all quarried within 400 feet of the dam and was hoisted and conveyed to the wall by two cableways, each about 800 feet long, and the cable being 1½ inches in diameter. Two derricks, operated by a 36 inch Pelton wheel, one at each end of the dam, were placed so as to receive and deposit the loads directly from the cable and swing them into position. The concrete used to embed the blocks of stone was mixed in the proportion of one cement, three of sand and six of broken stone, crushed so as to pass through a mesh of 2½ inches. The stones were placed not less than 6 inches apart and the space filled with smaller stone, all well rammed into place with iron rammers.



THE HEMET DAM DURING CONSTRUCTION, SHOWING THE ROCK CRUSHER, TRAMWAY AND THE DISTANT VALLEY, NOW THE BED OF THE RESERVOIR.

A bedding of concrete 3 inches or more in thickness was made for each of the large stones. The use of cement enabled unskilled laborers to perform much of the work. Stone masons were only employed on the facings. Wages were $1.75 for laborers; stone masons were paid from $3 to $3.50 per day. The total cost was somewhat below $200,000.

The capacity of the reservoir created by this dam is 10,500 acre feet, equal to 3,430,000,000 gallons of water. At the ultimate height, 160 feet, the water inclosed would be fully three times greater. At ordinary requirements this would irrigate 15,000 acres.

The above particulars of the enterprise are from a paper read before the Technical Society of San Francisco by James E. Schuyler, C.E.

The Knapp Roller Boat Launched.

The roller steamer designed by Lawyer Knapp, of Napanee, was successfully launched at Toronto, September 8. The vessel is cylindrical, 110 feet long and 25 feet in diameter, and has a 60 horse power engine at each end. It is made of three-eighths inch boiler plate, and has an inner and outer casing with watertight space between them. The engines are expected to drive the outer cylinder rapidly around and make it roll over the water, the inventor looking for a speed of at least forty miles an hour.

A FEW NEW INVENTIONS.

We give a group of illustrations of patented inventions taken from patents recently issued from the United States Patent Office.

The selection has not been made with the view of showing any special class of inventions, but merely to show the great and diversified activity that prevails among inventors.

GAS EXHAUSTING APPARATUS.—This exhausting apparatus is designed for use in connection with the exhausting of the bulbs of incandescent electric lamps.

It has many features in common with other mercurial pumps, also many that are novel. It quickly produces a very high vacuum by simply raising and lowering the vessel of mercury.

Each manipulation of the vessel, g^1, up and down will exhaust from the lamp bulbs and the ring, e^2, ninety-nine one-hundredths of what remains of the gas at the beginning of each manipulation, leaving only one one-hundredth behind. Thus, if the first manipulation, when the air was driven out from the vessel, k^3, be not considered, the remaining quantity of gas in the bulbs and ring, e^2, after the first effective manipulation of the vessel, g^3, in the manner described will be one one-hundredth of the original quantity of gas. After the second manipulation the residue will be one one-hundredth of what remained after the first manipulation, or one ten-thousandth of the original quantity of gas, and so on until, after the tenth manipulation, the residual gas in the bulbs and ring, e^2, will be one-quintillionth of said original quantity.

J. W. T. Olan, of New York, is the inventor of this apparatus.

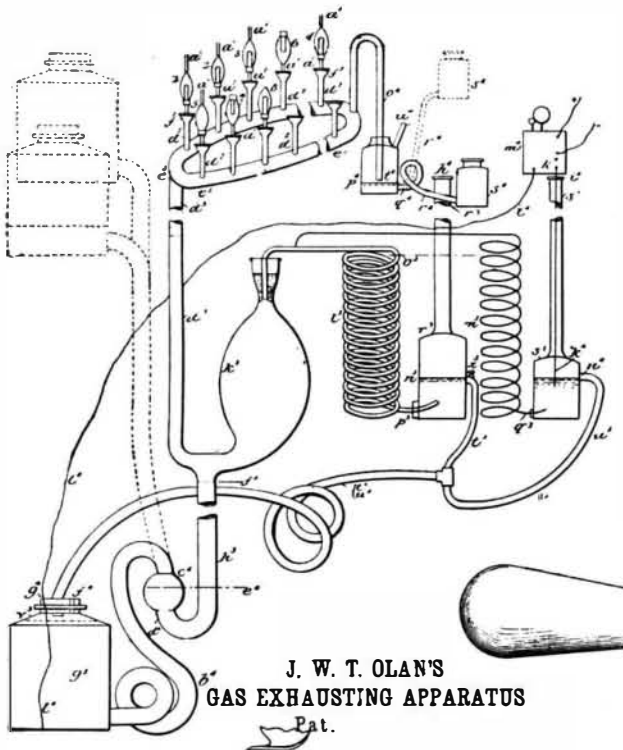
TILTING SADDLE BAR AND SEAT POST FOR BICYCLES.—The object of this invention, which has been patented by Charles Wooster, of New York City, is to secure an easy, adjustable saddle which may be rendered adaptable to any rider, or to the same rider under different circumstances.

The seat bar is jointed to the saddle post and provided with a serrated sector which is capable of being clamped in any desired position by a follower placed in the side of the seat post and pressed by a lever screw.

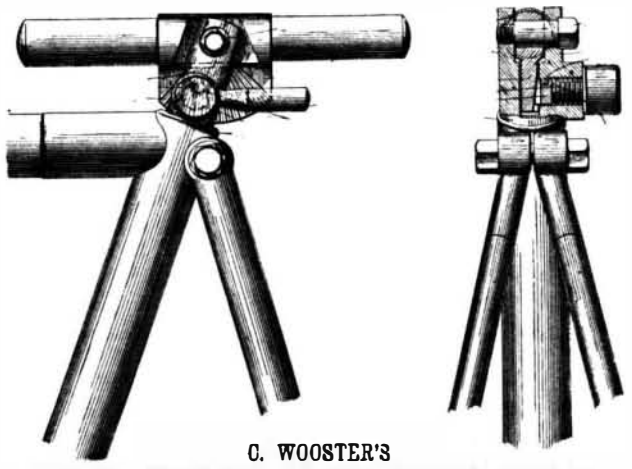
This device permits of adapting the saddle to different persons, and it permits the same rider to vary his position from time to time.

COMBINED STEAM ENGINE AND BOILER.—We give a sectional view of a new form of steam engine patented by W. Schmidt, of Ballenstadt, Germany.

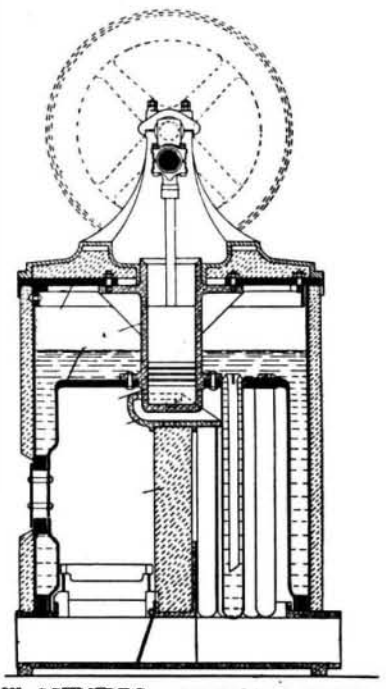
This invention relates to steam boilers and engines in which the cylinder of the engine is either partly or wholly arranged in the boiler. There are combined steam engines and boilers in which the cylinder is ar-



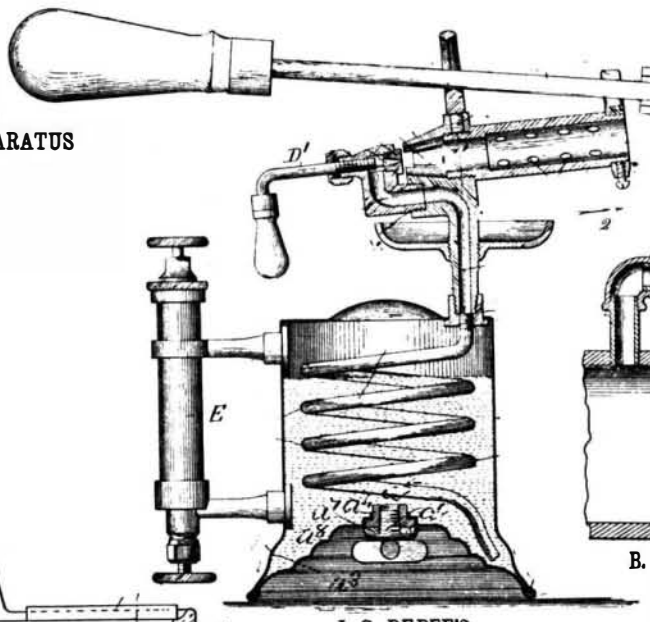
J. W. T. OLAN'S GAS EXHAUSTING APPARATUS



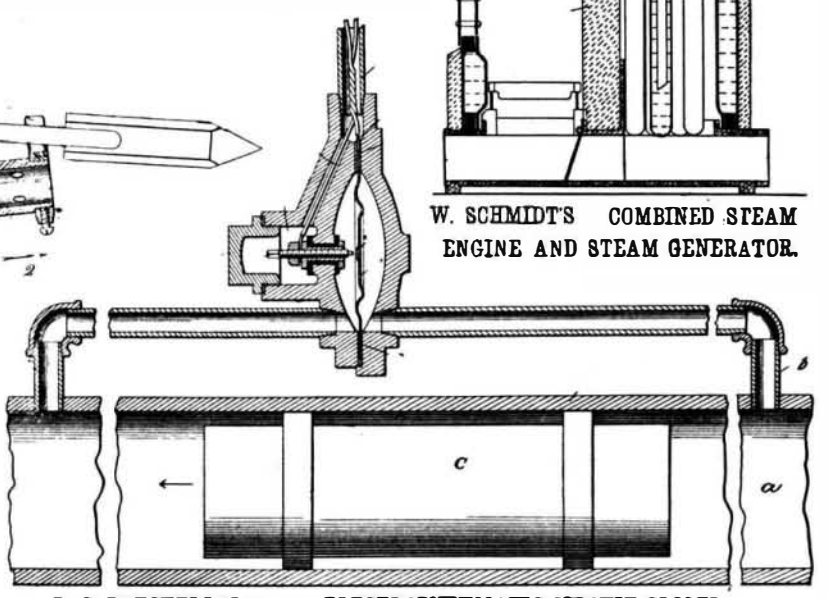
C. WOOSTER'S TILTING SADDLE BAR AND SEAT POST FOR BICYCLES.



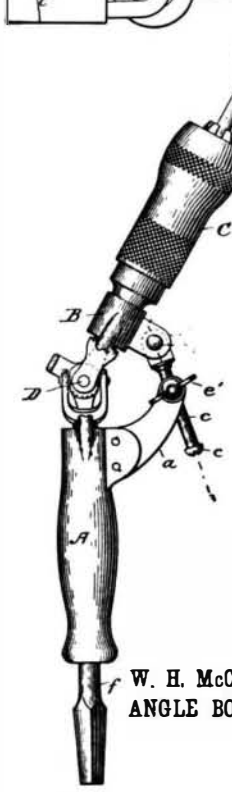
W. SCHMIDT'S COMBINED STEAM ENGINE AND STEAM GENERATOR.



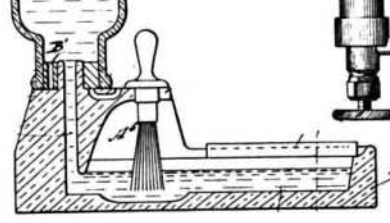
J. C. DUPEE'S BRAZING APPARATUS.



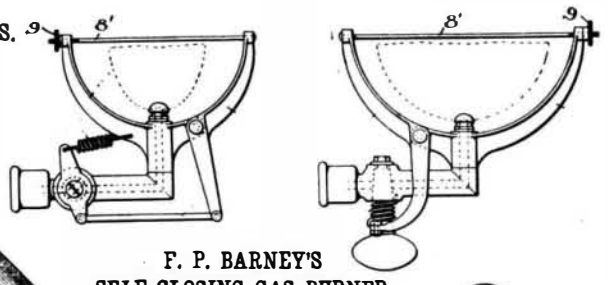
B. C. BATCHELLER'S ELECTROPNEUMATIC CIRCUIT CLOSER.



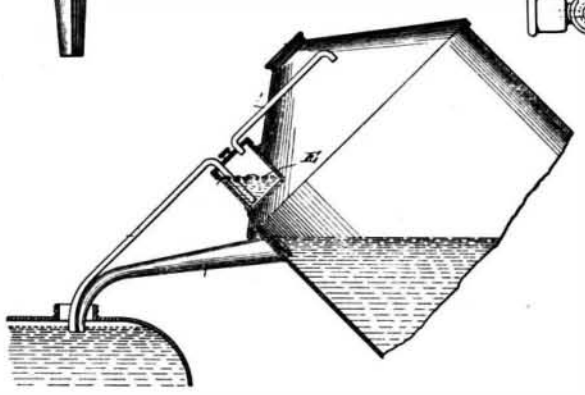
W. H. McCOY'S ANGLE BORER.



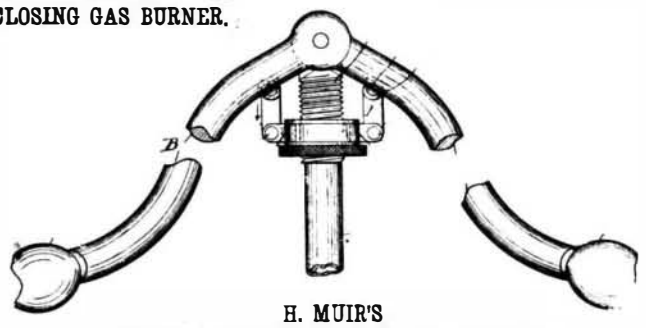
W. H. BURLAND'S GUMMING APPARATUS.



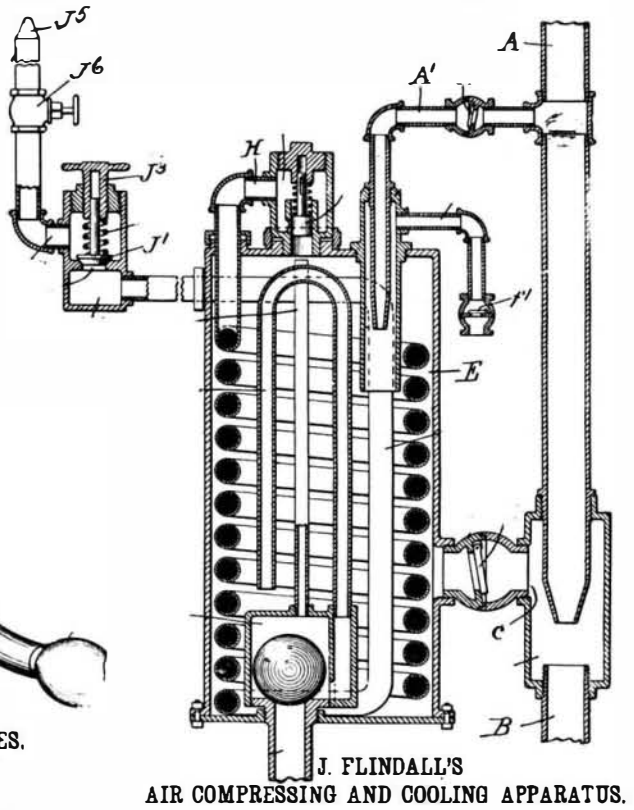
F. P. BARNEY'S SELF CLOSING GAS BURNER.



W. BELL'S OIL CAN.



H. MUIR'S ADJUSTABLE HANDLE BAR FOR BICYCLES.



J. FLINDALL'S AIR COMPRESSING AND COOLING APPARATUS.

SOME RECENTLY PATENTED INVENTIONS.