# IRRIGATION DEVELOPMENT.

HISTORY, CUSTOMS, LAWS, AND ADMINISTRATIVE SYSTEMS RELATING TO IRRIGATION, WATER-COURSES, AND WATERS IN FRANCE, ITALY, AND SPAIN.

#### THE INTRODUCTORY PART

OF THE

REPORT OF THE STATE ENGINEER OF CALIFORNIA,

ON

IRRIGATION AND THE IRRIGATION QUESTION.

WM. HAM. HALL, C.E., State Engineer.

#### SACRAMENTO:

STATE OFFICE, : : JAMES J. AYERS, SUPT. STATE PRINTING. 1886.

## CONTENTS

## A .- ROMAN WATER-LAWS-INTRODUCTORY.

### CHAPTER I.

ROMAN LAWS AND ADMINISTRATIVE POLICY WITH RESPECT TO WATERS AND WATER-COURSES.

Section II—Control of Public Rivers and Deds.

Section II—Control of Public Rivers and waters:—Rights of navigation and fishery; Guarding channels, banks, beds, and waters; Construction and maintenance of works; Riparian right to protect banks; Public waters always devoted to public use; Permits to divert and use; Exercise of privileges; Public springs and reservoirs; Prescriptive rights; Waste prohibited.

Section III—Control of Water and Deds.

SECTION III—CONTROL OF WATERS IN PRIVATE WORKS:—Springs on private lands, private property; Rights to use spring waters; Prescription; Agreement; Spring waters become common property; Riparian rights to use; Water in private works, private property; Use of private waters; Waste prohibited...p. 45.

## B .- FRENCH IRRIGATION DEVELOPMENT.

## CHAPTER II—FRANCE (1);

## RIGHT OF PROPERTY IN AND CONTROL OF WATER-COURSES.

Section II—Water Laws and regulations:—Agriculture and irrigation; Manufacturing and water power; Internal transportation; Inundations; Sanitary necessities. Agriculture a leading interest; High rank of irrigation in the laws; The administration favors irrigation. Statutory law; Two branches

of a sort of Common law; Judicial decisions; Administrative rulings; No gen-

SECTION III—THE ADMINISTRATION:—Supervision of public and common property; Administration of non-navigable and of navigable streams. Administrative purpose and policy; Regulation of works and waters on floatable streams, and of works in streams not floatable. Government organization; Central administration; Departmental governments; Communal governments. The 

#### CHAPTER III—FRANCE (2);

WATER PRIVILEGES ON, AND THE ADMINISTRATION OF NAVIGABLE AND FLOATABLE STREAMS.

Section I-Water privileges:-Irrigation, manufacturing, industrial, and municipal uses; Governmental regulation. Object of administration: Rivers and river works in France; Necessity for rivers conservancy; Systems on the lower and on the higher rivers; Public rivers; Non-navigable tributaries; Non-navigable arms of navigable rivers. Forms of irrigation enterprise; Individnal; Cobperative; Speculative companies. Applications and formalities; For water privileges on non-floatable streams, and on public streams. Water right grants; Obligations of grantees; Conditions of concession; Privileges of grantees: Benefits to company p. 74.

SECTION II—REQUIATION OF WORKS:—Government improvement of navigable rivers; Canalization of upper rivers; The hydraulic service. Organization for agricultural hydraulic works; Principles of cobperation and compulsion; When water an enemy and when an auxiliary. Regulation of dams and headworks; Combination of navigation with water-power or irrigation dams.—p. 90.

SECTION III—OPERATION AND MAINTENANCE; Maintenance of public, private, and joint works; Distribution of expense of cleaning and dredging of channels; Police of streams; Powers of departmental councils; Compulsory removal of objectionable works; Administrative duties of prefects. Water privilege rents; Rates for water-power, irrigation, industrial uses, municipal uses; Revision of rents every thirty years.....p. 94.

## CHAPTER IV-FRANCE (8);

WATER-RIGHTS ON, AND THE ADMINISTRATION OF NON-FLOATABLE STREAMS.

Section I—Rights to the use of water.—Water-rights previous to the time of the Code Napoleon; Riparian claims to absolute control of streams; The waters a common property of all people. Riparian water-rights under the code; The riparian water-right and the right of way; Law of 1845; The dam privilege law of 1847; Control of the fall of a stream Nature of the riparian right to water; An undefined part of a common right to use, subject to regulation. The right of irrigation; Absorption of water; Drainage and residue to be returned; Each case one for equitable administration.

p. 100.

SECTION II-SUPERVISION OF CONSTRUCTION OF WORKS:-The decentralization 

Section III—Regulation; Dimensions and term to obtain the Property of the Prop ccurses..... p. 115.

## CHAPTER V-FRANCE (4);

RIGHT OF PROPERTY IN SPRINGS, AND RIGHTS TO USE SPRING WATERS

Section I—Ownership and control of springs:—Absolute ownership; Ownership of land carries with it ownership of springs on it; This doctrine for a long time strongly opposed, but upheld; Right to use spring waters may be 

SECTION II—ACQUIRED RIGHTS TO SPRING WATERS:—Public and private use of springs; Necessities of communities; Interests of navigation; Private acquirement of right by title and by prescription; Servitudes, resulting from divisions 

SECTION III-DRAINAGE AND OTHER RIGHTS:-Natural right of drainage; Restrictions on extension. Right to dig or bore for water: Extent of privilege; Forfeiture...p. 132

## CHAPTER VI—FRANCE (5):

RIGHT OF WAY TO CONDUCT WATER, AND RIGHT TO ABUT A DAM.

## CHAPTER VII—FRANCE (0);

## IRRIGATION ENTERPRISE AND ORGANIZATION.

Section 1-Governing influences:-Climatic and social influences; Irriga-

## CHAPTER VIII—FRANCE (7);

## GOVERNMENTAL POLICY AND IRRIGATION CONCESSIONS.

SECTION I—FEATURES OF FOLICY AND FORMS OF ENTERPRISE:—Political and social conditions; Irrigation not made a general national work; Contrast between the case of France and those of India and Egypt. Forms of governmental encouragement; Tax rebate on advanced values due to irrigation; Loans, advances, subsidies, guarantees; Main works built for associations; Main works built for associations; Statistical alloy of irrigation. Statistical atlas of irrigation.....p. 155.

SECTION II—NOTABLE INSTANCES OF ENTERPRISE AND ENCOURAGEMENT:—The canals des Alpines, Carpentras, Cadenet, St. Martery, Siagne, Siagnole, Bourne, Rhone, Vesubie, Pierre-latte, Manosque, Herault: Other late works....p. 165.

## TABLE OF CONTENTS.

## C.—ITALIAN IRRIGATION DEVELOPMENT.

INTRODUCTION—Importance of the study of irrigation experience in Italy:—The valley of the Po, the classic land of irrigation; Magnitude, number, and excellence of its irrigation works; Long continued systemization of its irrigation practice; Its irrigation customs crystallized into well ordered codes of 

## CHAPTER IX—ITALY (1);

RIGHT OF PROPERTY IN, AND CONTROL OVER WATER-COURSES AND WATER-Sources.

Section I—Bahis of Property rights in Water-courses and Waters in North-ern Italy:—Government ownership of all natural streams of importance as irrigation feeders; Poyal ordinances and codes; Neither navigability nor float-ability the test of public importance of a stream in Italy; The volume of waters available for irrigation, the test. Government control of water-courses; Gen-eral regulations for water-courses in Piedmont; River regulations in London. 

SECTION II—OWNERSELP AND CONTROL OF SPRINGS:—Character, number, and importance of springs in the valley of the Po; Property right in springs, and acquired rights to use spring waters. Origin and source of the waters; Restrictions on the opening of new springs: In Lombardy; In Piedmont. Regulations present questions for experting.—p. 107.

Section III-The Rightlan Right:-No private streams, except small rivu-

## CHAPTER X-ITALY (2);

WATER PRIVILEGES AND CANAL WORKS, AND THE ADMINISTRATION OF WATERS AND WORKS.

Section II-Administrative regulation of water-courses:-General administrative organization; Departmental administrative organizations; River reg-

Section III - Administration of government canals: - Former Piedmontene administrative bureau; The office of works, and the engineering corps; Instruc-

## CHAPTER XI-ITALY (°);

### RESULATION OF IRRIGATION PRACTICE.

Section I-Distribution and measurement of waters:-Hydraulic science Oberton I - Distribution and measurement or walkers - Hydraume science and practice; Problems of distribution and measurement; Former Piedmont-ese legislation; Present legislation for all Italy; Distribution by volume, by use 

SECTION II—RIGHTS OF IRRIGATORS:—(1) Right to a continuance of water from canals; The former ruling in Piedmont, not recognized in the Sardinian code; Long leases and carefully drawn agreements, the outcome of these contentions; (2) Right to the use of spare waters; The Sardinian and the Italian codes, on this point 

## CHAPTER XII-ITALY (4);

## REGULATION OF DRAINAGE AND WORKS CONNECTED WITH IRRIGA-TION PRACTICE.

Section I—Regulation of works accessory to irrigation practice:—Distances to be preserved from boundaries of tracts; Obligations concerning the construction and maintenance of works; Prevention of interference....p. 268.

Section II—The rights and obligations of drainage:—Necessity for drainage in Italy: Troubles arising out of drainage matters: The principles of the former Piedmontese, and Lombardian, and present Italian laws; Comparison 

## CHAPTER XIII—ITALY (5);

## RIGHT OF WAY TO CONDUCT WATERS.

SECTION II-SERVITUDE OF WAY TO CONDUCT WATERS:-Piedmont under the 

## CHAPTER XIV-ITALY (0):

## IRRIGATION ORGANIZATION AND REGULATION.

SECTION II-ORGANIZATION AND MANAGEMENT OF IRRIGATION ASSOCIATIONS:-SECTION 11—ORGANIZATION AND MANAGEMENT OF IRRIGATION ASSOCIATIONS:—General association of irrigation west of the Sesia—Piedmont; Organization and management; Government lease of waters and canals to the association; Rights and privileges under the lease; Management of waters and maintenance of market. However, and repts. 

## CHAPTER XV-ITALY (7);

#### IRRIGATION ENTERPRISE

SECTION I-FORMS AND EXAMPLES OF CANAL ENTERPRISE:-The association prin-

SECTION II—Concessions to Capitalized Companies:—Analysis of the concession to the Cavour canal company; (1: Obligations of the company; (2) Conditions of the concession; (3) Privileges to the company; (4) Benefits to the company.....p. 339.

SECTION III-GOVERNMENT IRRIGATION POLICY:-General policy as to public works; Prize competition in irrigation practice; Hydrographic survey of 

#### B.—SPANISH IRRIGATION DEVELOPMENT

## CHAPTER XVI—SPAIN (1):

#### OLD GENERAL WATER-LAWS.

SECTION I-ORIGIN AND DEVELOPMENT OF THE LAWS OF SPAIN:-Roman, Gothic,

SECTION III-CONTROL AND REGULATION OF WATERS AND WATER-COURSES :- Of rivers and their waters; Of small streams and riparian rights; Of springs and spring waters: Of rain and torrent waters.....p. 371.

## CHAPTER XVII—SPAIN (2);

## OLD LOCAL WATER-LAWS AND CUSTOMS-VALENCIA.

Section I—District of Valencia—Associations:—The garden plain of Valencia; Its seven associated irrigation communities; Water appurtenant to land; Syndics; Syndicates; Extensive powers; Peculiar duties, and responsibillties ......p. 383.

Signon II—District of Valencia—Administration:—Joint board of syndies; Sydicate-general for the Turia: Local administration of natural streams; Tribunal of waters, or jury of irrigation: Origin of Spanish arbitrative system in irrigation....p, 393.

SECTION III - DISTRICTS OF JUCAR AND MURVIEDRO: - Jucar -- One great association of political communities, administering one great irrigation work; General council of deputies named by town councils and large private interests; Water  Section IV—Districts of Alicante and Elche:—Alicante—Complex water-rights; Natural flow held as separate property; Stored water appurtenant to lands; Mixed administration; Water tickets. Elche—Water a separate property; Daily auction sales of water turns; Judge of sales; Evil results of the 

## CHAPTER XVIII—SPAIN (3);

# OLD LOCAL WATER-LAWS AND CUSTOMS-MURCIA AND GRANADA.

Section I—Murcia—District of Murcia:—Water appurtenant to lands; Self government in irrigation distribution; The district and twenty subdistricts: Water supply and main works in charge, municipality: General, half-district, and subdistrict assemblies; Agents or attorneys; Council of experts.... p. 414.

Section II—Murcia—District of Lorca:—Water holding gradually sepa-SECTION 11—AURCIA—DISTRICT OF LORGA:—Water notding gradually separated from land; Great government reservoirs; Curious and complex system of water-rights; Auction sales of water; Evils of the system; Government distributions of water in the system is the system of the 

SECTION III—MURCIA—DISTRICT OF ALMANSA:—Water supply from an ancient reservoir: Water appurtenant to lands; Elective syndicate of three members; Water rates only on lands irrigated; Extraordinary assessments on all 

SECTION IV-GRANADA-DISTRICT OF GRANADA: Ancient Moorish system preserved intact; Many small works; No general system or stated organization; Rule of custom; Apparent confusion, but real order. Reasons for out-

## CHAPTER XIX—SPAIN (4):

New Water-Laws-Ownership and Control of Water-Courses AND WATER-Sources.

SECTION I - MODERN WATER-LAWS AND REGULATIONS: - Development of consti-

SECTION II-OWNERSHIP OF AND RIGHTS TO WATERS AND WATER-COURSES:-Definitions, rain-waters, rising waters, rivers, standing waters; Beds, banks, and channels; Property rights in foregoing; Rights of water-source owners; Riparian rights.

SECTION III—ACQUIRED RIGHTS TO THE USE AND CONTROL OF WATERS:—Private 

## CHAPTER XX-SPAIN (5);

## New Water-Laws-Right of way to conduct Waters.

Section I Servitudes of AQUEDUCT and ABUTMENT: These servitudes of recent grafting on Spanish law, from the French and Italian; Their natures 

SECTION II-RIGHTS OF WAY BY CONDEMNATION OF LANDS:-Expropriation of private properties for purposes of public utility; General expropriation law; 

## CHAPTER XXI—SPAIN (6);

## NEW WATER-LAWS-ADMINISTRATION AND POLICE.

Section I-General administration of waters and water-courses:-The 

### TABLE OF CONTENTS.

Section II—Local administration of waters and lexication:—Self government in irrigation; Development of local irrigation administration; Ancient custom and modern system ......p. 483.

SECTION III—IRRIGATION COMMUNITIES:—Governmental policy, water-rights. 

SECTION IV-COMMUNITY ADMINISTRATION:-Ordinances of an irrigation community; Regulations for syndicates, general syndicates, and juries of irriga-tion; A system perfected from the old local models described in chapters XVII and XVIII.....p. 498.

## CHAPTER XXII—SPAIN (\*);

GOVERNMENTAL POLICY AND IRRIGATION ENTERPRISE.

Section II-Present irrigation policy of Spain:—Review of laws now in 

SECTION III—NOTABLE IRRIGATION ENTERPELSES:—Canal and reservoir concessions under the liberal laws; Lengths, water-rights, irrigable lands, estimated 

#### APPENDIX I.

ARTICLES OF THE CIVIL CODE OF FRANCE-WATER-COURSES, WATERS, AND IRRIGATION.

#### BOOK II.

OF PROPERTY AND ITS MODIFICATIONS.

#### TITLE I.

#### OF THE CLASSIFICATION OF PROPERTY.

CHAPTER I-OF IMMOVABLE PROPERTY.

Servitudes-Rights-of-way for waters, dam rights, and acquired rights to take waters—rank as such......p. 527. CHAPTER III-OF PROPERTY WITH REFERENCE TO THOSE WHO ARE IN POSSES-

Public ownership of floatable and navigable rivers and streams: Things which are not susceptible of private ownership; Common canership of rights to 

#### TITLE II

#### OF PROPERTY.

CHAPTER II—OF THE RIGHT OF ACCESSION OVER WHAT IS CONNECTED WITH AND INCORPORATED WITH ARYTHING.

Ownership of springs; Use of private property; Police power of regulation, reserved; Gain and loss to riparian estates by depositing or abrading action of currents; Alluvion; Riparian rights to streum beds; Public ownership of beds 

#### TITLE IV.

## OF SERVITUDES OR MANORIAL SERVICES.

CHAPTER I-OF SERVITUDES DERIVED FROM THE SITUATION OF PLACES.

CHAPTER II-OF SERVITUDES ESTABLISHED BY LAW.

CHAPTER III-OF SERVITUDES ESTABLISHED BY THE ACT OF MAN.

Rights-of-way for waters established by servitude; Also rights to take waters from private lands. Modes of establishing servitudes; By agreement; By division of estates; By prescriptive use. Rights of proprietors of dominant of experiences. 

#### BOOK III.

## OF DIFFERENT MODES OF ACQUIRING PROPERTY.

#### GENERAL DISPOSITIONS.

### APPENDIX II.

ARTICLES OF THE CIVIL CODE OF ITALY-WATER-COURSES, WATERS, AND IRRIGATION,

#### BOOK II.

## OF PROPERTY AND ITS MODIFICATIONS.

#### TITLE I.

## OF THE CLASSIFICATION OF PROPERTY.

CHAPTER I-OF IMMOVABLE PROPERTY.

Springs, reservoirs, and water-courses, thus classed; Canals, thus classed under certain conditions; Also Servitudes—Right-of-way for waters, etc.-p. 535. CHAPTER III—OF PROPERTY RELATIVELY TO THE PERSON TO WHOM IT BELONGS.

Public properties and private properties; Rivers and torrents, public; Public domain inalienable; Communal control of certain common properties. p. 536.

#### TITLE II. OF PROPERTY.

#### CHAPTER I—GENERAL PROVISIONS.

CHAPTER III—OF THE RIGHT OF ACCESSION TO THAT WHICH IS INCORPORATED WITH OR UNITED TO A THING.

Right to excavate, and to discover waters on private property; Loss and gain Y to riparian lands by changes of channel, abrasions, and deposits—alluvion; Ownership of occupied and of abandoned channel beds; Of newly formed islands; Riparian bank-rights.........p. 537.

#### TITLE III.

## OF THE MODIFICATIONS OF PROPERTY.

CHAPTER II-OF PRADIAL SERVITUDES. Section I-Of Servitudes Established by Law.

Those for public use—water-courses, tow-paths right-of-way—Special administrative regulations. Those for private use—Regulated by rural police rules and present section....p. 539.

3 L Servitudes resulting from situations of places: Right of natural drainage over lands; Privileges and obligations of lower proprietors; Obligations of upper proprietors; Construction and maintenance of works and channels; 

Section II-Of Servitudes Established by the Acts of Man.

\$ I. Different kinds of Servitudes which can be laid on Estates: Classification; Legal character of the right to take water: Concessions or permits to take water; Conditions; Measurement and division of water..........p. 544.

3 L. Manner in which Servitudes become established by the acts of man: Title or agreement; Prescription; Division of estates; What constitutes pre-

Section III-In what Manner Servitudes are Exercised.

What a right of servitude includes; Obligations to clean, maintain, and repair works; Compensation for injuries from waters; Duties of canal, and bordering drainage, or reclamation works; Compulsory formation of such associations; 

Section IV-Extinguishment of Servitudes.

Non-user: Prescription: Evidences of servitudes, on servient estates. p. 549.

#### TITLE IV.

#### OF COMMUNITY PROPERTY.

Pormation of irrigation, drainage, or reclamation communities; Management of community affairs; Rights and obligations of members; Responsibilities of communities \_\_\_\_\_\_p. 550,

#### APPENDIX III.

GENERAL WATER-LAW AND IRRIGATION CODE OF SPAIN.

#### TITLE I.

## OF THE DOMINION OF TERRESTRIAL WATERS.

CHAPTER I-RAIN-WATERS.

CHAPTER II-LIVING WATERS, SPRINGS, AND STREAMS.

Waters of public domain; Waters of private ownership; Rights of casual employment of waters; Preservation and forfeiture of primary rights; Mineral 

CHAPTER III-STANDING WATERS.

Ownership of waters of lakes, marshes, and ponds; When private, when 

CHAPTER IV-SUBTERBANEAN WATERS.

Rights acquired by discovery of subterranean waters; Concessions for explorations on public domain; Restrictions placed on opening of ordinary, and of 

#### TITLE II.

## OF CHANNELS, WORKS, AND DRAINAGE.

CHAPTER V-CHANNELS, BANKS, MARGINS, AND ACCRETIONS.

CHAPTER VI-WORKS OF DEFENSE AGAINST PUBLIC WATERS.

Rights of riparian owners to construct levees, and works to protect banks; August of riparian owners to construct levees, and works to protect banks; Governmental regulation of construction and maintenance; River works of public importance constructed by the state; Water supply, flood regime, and channel studies; Supervisory powers of the minister of public works...p. 561.

CHAPTER VII-DRAINAGE AND RECLAMATION OF LANDS,

Privileges to owners to reclaim; Compulsory couperation in drainage and reclamation; Compulsory drainage of lands; Exercise of the state's police power; Concessions of reclamation rights on public domain; Public works of 

#### TITLE III.

## OF THE SERVITUDES ON THE SUBJECT OF WATERS.

### CHAPTER VIII-NATURAL SERVITUDES,

CHAPTER IX-SERVITUDES UNDER THE LAW.

Right-of-way for water; Enforcement of, for public purposes, for certain private purposes. Right-to-abut a dam; Enforcement, etc. Right to draw water; Imposed for public purposes, etc. Tow-path, and other public and private rights on riparian properties; Governmental classification of streams; Rights of those who navigate and fish in the streams, to the use of banks; Obligations of riparian proprietors.......p. 565.

#### TITLE IV.

## OF THE USEFUL EMPLOYMENT OF PUBLIC WATERS.

CHAPTER X-COMMON UTILIZATIONS.

CHAPTER XI-SPECIAL UTILIZATIONS.

#### TITLE V.

## OF THE ADMINISTRATION OF WATERS.

CHAPTER XII-POLICE OF WATERS.

CHAPTER XIII-IRRIGATION COMMUNITIES.

CHAPTER XIV-GOVERNMENTAL ADMINISTRATION OF WATERS.

CHAPTER XV-THE COURTS IN THE MATTER OF WATERS.

Jurisdiction of the administrative courts: Of the civil courts of law; Of the 

SCHEDULE-GENERAL PROVISIONS.

#### APPENDIX III-A.

MODEL ORDINANCE FOR AN IRRIGATION COMMUNITY.

Issued as an administrative regulation by the general government of 

#### MEMORANDUM.

#### IRRIGATION REPORT OF THE STATE ENGINEER.

Acknowledgments of assistance and favors received, relating to the present vclume......p. 605. Authorities and data from which this volume has been written; and the relative extent of their use .....p. 608. Other forthcoming Reports of the State Engineer, and compilations by the S. Maps of the State and of its Irrigation Districts; prepared by the State Engineering Department.....p. 608.

# IRRIGATION DEVELOPMENT.

LEGISLATION AND ADMINISTRATION,

IN COUNTRIES UNDER THE CIVIL LAW.

FRANCE; ITALY; SPAIN.