DEPARTMENT OF THE INTERIOR,

CENSUS OFFICE.

FRANCIS A. WALKER, Superintendent,
Appointed April 1, 1879; resigned November 3, 1881.

CHAS. W. SEATON, Superintendent,
Appointed November 4, 1881.

PRODUCTION, TECHNOLOGY, AND USES

OF

PETROLEUM AND ITS PRODUCTS.

BY

S. F. PECKHAM.

THE MANUFACTURE OF COKE.

BY

JOSEPH D. WEEKS.

BUILDING STONES OF THE UNITED STATES,

AND

STATISTICS OF THE QUARRY INDUSTRY FOR 1880.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1884.

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
CENSUS OFFICE,
WASHINGTON, D. C., *September* 24, 1884.

Hon. H. M. TELLER,
Secretary of the Interior.

SIR: I have the honor to transmit herewith the tenth volume of the quarto series comprising the final report on the Tenth Census. The volume contains three reports, viz: (1) On the Production, Technology, and Uses of Petroleum and its Products, by S. F. Peckham; (2) on the Manufacture of Coke, by Joseph D. Weeks; (3) on the Building Stones of the United States and Statistics of the Quarry Industry, by George W. Hawes *et al.*

The report on the building stones of the United States was originally confided to the late Dr. George W. Hawes, curator of the department of mineralogy and lithology in the National Museum, whose regretted death prevented its completion by himself. After his decease the work was continued on the general plan originally designed, and under the subsequent supervision of Mr. Henry Gannett was brought to completion. The names of the authors who assisted in its preparation are appended to such chapters or parts as were contributed by them.

I have the honor to be, very respectfully, your obedient servant,

C. W. SEATON,
Superintendent of Census.

LITHOTYPE PRINTING CO., GARDNER, MASS. NEW YORK OFFICE, 114 NASSAU ST.

A PETROLEUM FIELD.

(An Original Photograph.)

REPORT

ON THE

PRODUCTION, TECHNOLOGY, AND USES

OF

PETROLEUM AND ITS PRODUCTS.

BY

S. F. PECKHAM,
SPECIAL AGENT.

TABLE OF CONTENTS.

Page.

LETTER OF TRANSMITTAL ..... vii, viii

PART I.

THE NATURAL HISTORY OF PETROLEUM, TOGETHER WITH A DESCRIPTION OF THE METHODS EMPLOYED IN THE PRODUCTION, TRANSPORTATION, AND SALE OF PETROLEUM IN THE UNITED STATES, AND STATISTICS OF THE PRODUCTION OF PETROLEUM IN THE UNITED STATES AND FOREIGN COUNTRIES DURING THE YEAR ENDING MAY 31, 1880.

CHAPTER I.—HISTORY OF THE DISCOVERY OF PETROLEUM AND THE DEVELOPMENT OF THE PETROLEUM INDUSTRY 1–18
- SECTION 1.—HISTORICAL NOTICE OF BITUMEN PRIOR TO THE YEAR 1800 3–5
- SECTION 2.—HISTORICAL NOTICE OF BITUMEN FROM THE YEAR 1800 TO 1850 5–9
- SECTION 3.—THE RISE OF THE PARAFFINE-OIL INDUSTRY 9–10
- SECTION 4.—HISTORICAL NOTICE FROM 1850 TO THE COMPLETION OF DRAKE'S WELL (AUGUST, 1859) 10, 11
- SECTION 5.—HISTORICAL NOTICE OF THE PETROLEUM INDUSTRY IN THE UNITED STATES SINCE THE COMPLETION OF DRAKE'S WELL (AUGUST, 1859) 11–14
- SECTION 6.—HISTORICAL NOTICE OF THE RUSSIAN PETROLEUM INDUSTRY 14, 15
- SECTION 7.—HISTORICAL NOTICE OF THE PETROLEUM INDUSTRY OF GALICIA 16
- SECTION 8.—HISTORICAL NOTICE OF THE PETROLEUM INDUSTRY OF CANADA 17
- SECTION 9.—HISTORICAL NOTICE OF THE JAPANESE PETROLEUM INDUSTRY 17
- SECTION 10.—HISTORICAL NOTICE OF THE PERUVIAN PETROLEUM INDUSTRY 17, 18
- SECTION 11.—HISTORICAL NOTICE OF THE ITALIAN AND OTHER PETROLEUM INDUSTRIES 18

CHAPTER II.—THE GEOGRAPHICAL DISTRIBUTION OF PETROLEUM AND OTHER FORMS OF BITUMEN 19–36
- SECTION 1.—THE OCCURRENCE OF BITUMEN IN THE UNITED STATES 19–27
- SECTION 2.—GEOGRAPHICAL DISTRIBUTION OF BITUMEN IN FOREIGN COUNTRIES 27–36

CHAPTER III.—THE GEOLOGICAL OCCURRENCE OF BITUMENS 37–52
- SECTION 1.—GENERAL CONSIDERATIONS 37, 38
- SECTION 2.—THE GEOLOGICAL OCCURRENCE OF PETROLEUM IN EASTERN NORTH AMERICA 38–52

CHAPTER IV.—THE CHEMISTRY OF PETROLEUM 53–59
- SECTION 1.—THE CHEMISTRY OF CRUDE PETROLEUM 53, 54
- SECTION 2.—THE PROXIMATE ANALYSIS OF PETROLEUM 54–58
- SECTION 3.—THE CHEMICAL ACTION OF REAGENTS UPON PETROLEUM AND ITS PRODUCTS 58, 59

CHAPTER V.—THE ORIGIN OF BITUMENS 59–74
- SECTION 1.—INTRODUCTION 59
- SECTION 2.—CHEMICAL THEORIES 59–61
- SECTION 3.—THE THEORY THAT BITUMEN IS INDIGENOUS TO THE ROCKS IN WHICH IT IS FOUND 62–65
- SECTION 4.—THE THEORY THAT BITUMEN IS A DISTILLATE 65–67
- SECTION 5.—AN ATTEMPT TO INCLUDE OBSERVED FACTS IN A PROVISIONAL HYPOTHESIS 67–74

CHAPTER VI.—THE DEVELOPMENT OF OIL TERRITORY 75, 76

CHAPTER VII.—THE PRODUCTION OF OIL 77–91
- SECTION 1.—PRIMITIVE METHODS 77, 78
- SECTION 2.—ARTESIAN WELLS—THE DERRICK 78–81
- SECTION 3.—THE DRILLING-TOOLS 81, 82
- SECTION 4.—DRILLING WELLS 82–84
- SECTION 5.—THE TORPEDO 84, 85
- SECTION 6.—LOCATION OF WELLS 85, 86
- SECTION 7.—THE OIL-SAND 86, 87
- SECTION 8.—THE MANAGEMENT OF WELLS 87–89
- SECTION 9.—YIELD OF WELLS 89, 90
- SECTION 10.—FLOODING 90, 91

Page.

CHAPTER VIII.—TRANSPORTATION AND STORAGE OF PETROLEUM 92–102
SECTION 1.—EARLY HISTORY OF TRANSPORTATION 92
SECTION 2.—PIPE-LINES 93–95
SECTION 3.—CONCERNING IRON-TANK FIRES 95–98
SECTION 4.—CONCERNING THE STORAGE OF OIL AND ACCUMULATED STOCK 98–101
SECTION 5.—STATISTICS OF THE TRANSPORTATION OF OIL DURING THE CENSUS YEAR 101, 102

CHAPTER IX.—PETROLEUM IN COMMERCE 103–133
SECTION 1.—COMMERCIAL VARIETIES 103, 104
SECTION 2.—THE MANAGEMENT OF PIPE-LINES 105
SECTION 3.—BROKERAGE 106, 107
SECTION 4.—PETROLEUM AS AN ARTICLE OF FOREIGN COMMERCE 107–110
TABLE OF EXPANSION OF THE WEST VIRGINIA NATURAL OILS 111–115
TABLES FOR THE RAPID AND EXACT COMPUTATION OF THE NUMBER OF GALLONS CONTAINED IN ANY GIVEN WEIGHT OF OIL OR OTHER LIQUID LIGHTER THAN WATER, WITHOUT MEASURING OR GAUGING 116–118
TABLES OF COMPARATIVE WEIGHTS AND MEASURES OF OIL 118–132
TABLE OF THE SPECIFIC GRAVITY CORRESPONDING TO EACH DEGREE OF BAUMÉ'S HYDROMETER; ALSO, THE NUMBER OF POUNDS CONTAINED IN ONE UNITED STATES GALLON AT 60° F 133

CHAPTER X.—PRODUCTION OF PETROLEUM IN THE UNITED STATES DURING THE CENSUS YEAR 134
SECTION 1.—THE CONDITIONS OF THE PROBLEM 134–137
SECTION 2.—WELL STOCKS 137, 138
SECTION 3.—OIL THAT WAS WASTED AND BURNED 138, 139
SECTION 4.—ESTIMATE OF THE PRODUCTION OF THIRD-SAND OIL DURING THE CENSUS YEAR 139, 140
SECTION 5.—THE ACCUMULATION OF STOCKS 140–142
SECTION 6.—STATISTICS OF CAPITAL AND LABOR EMPLOYED IN THE PRODUCTION OF PETROLEUM DURING THE CENSUS YEAR 142–148
SECTION 7.—GENERAL STATISTICS RELATING TO THE PRODUCTION OF THIRD-SAND PETROLEUM 148–151
SECTION 8.—THE PRODUCTION OF THE PACIFIC COAST 151
SECTION 9.—THE FOREIGN PRODUCTION OF PETROLEUM IN COMPETITION WITH THE UNITED STATES 151–154

PART II.

THE TECHNOLOGY OF PETROLEUM.

CHAPTER I.—MIXTURES OF PETROLEUM 157
SECTION 1.—FILTERED PETROLEUM 157
SECTION 2.—MIXTURES OF PETROLEUM 157

CHAPTER II.—PARTIAL DISTILLATION 158
SECTION 1.—SUNNED OILS 158
SECTION 2.—REDUCED OILS 158

CHAPTER III.—GENERAL TECHNOLOGY OF PETROLEUM BY DISTILLATION 159–168
SECTION 1.—INTRODUCTION 159, 160
SECTION 2.—EARLY METHODS 160
SECTION 3.—DESTRUCTIVE DISTILLATION 160, 161
SECTION 4.—DESCRIPTION OF THE APPARATUS USED IN MANUFACTURING PETROLEUM 161–164
SECTION 5.—DESCRIPTION OF AN ESTABLISHMENT IN WHICH THE PRODUCTS ARE GENERAL 164–166
SECTION 6.—DESCRIPTION OF A MANUFACTORY WHERE NAPHTHAS, ILLUMINATING OILS, AND RESIDUUM ARE PRODUCED. 166, 167
SECTION 7.—MISCELLANEOUS PROCESSES 167, 168

CHAPTER IV.—PARAFFINE 168–178
SECTION 1.—HISTORY 168–170
SECTION 2.—SOURCES OF CRUDE PARAFFINE 170–173
SECTION 3.—PREPARATION OF PARAFFINE 173–176
SECTION 4.—PROPERTIES OF PARAFFINE 176–178

CHAPTER V.—SUBJECTS OF INTEREST IN CONNECTION WITH THE TECHNOLOGY OF PETROLEUM 178–185
SECTION 1.—"CRACKING" 178–180
SECTION 2.—"TREATMENT" 180–182
SECTION 3.—"SLUDGE" 182, 183
SECTION 4.—FIRES 183
SECTION 5.—THE SPECIAL TECHNOLOGY OF CALIFORNIA PETROLEUM 184, 185

CHAPTER VI.—STATISTICS OF THE MANUFACTURE OF PETROLEUM DURING THE CENSUS YEAR 186–192
SECTION 1.—INTRODUCTION 186
SECTION 2.—CAPITAL, LABOR, AND WAGES 187
SECTION 3.—MATERIALS EMPLOYED IN MANUFACTURING PETROLEUM 187, 188
SECTION 4.—THE PRODUCTS OF MANUFACTURE 188–190
SECTION 5.—BUILDINGS, MACHINERY, ETC 190–192

PART III.

THE USES OF PETROLEUM AND ITS PRODUCTS.

Page.

CHAPTER I.—THE USE OF MINERAL OILS FOR LUBRICATION 195–213
SECTION 1.—INTRODUCTION 195, 196
SECTION 2.—SPECIFIC GRAVITY 196, 197
SECTION 3.—CONTENT OF VOLATILE MATERIAL 197
SECTION 4.—THE FLASHING POINT 197, 198
SECTION 5.—SPONTANEOUS COMBUSTION 198
SECTION 6.—FLUIDITY 199
SECTION 7.—CHEMICAL TESTS 199–202
SECTION 8.—PRACTICAL RESULTS OF THE INVESTIGATIONS OF PROFESSOR ORDWAY 203
SECTION 9.—DETERMINATION OF THE VALUE OF LUBRICATING OILS BY MECHANICAL TESTS 203–213

CHAPTER II.—THE USES OF PETROLEUM AND ITS PRODUCTS FOR ILLUMINATION 214–239
SECTION 1.—INTRODUCTION 214
SECTION 2.—SAFE OILS 214–223
SECTION 3.—METHODS OF TESTING PETROLEUM 223–236
SECTION 4.—PETROLEUM LEGISLATION IN THE UNITED STATES 236, 237
SECTION 5.—BURNERS 238, 239

CHAPTER III.—NATURAL GAS AND THE CARBURETTING OF GAS AND AIR 240–246
SECTION 1.—OCCURRENCE AND COMPOSITION OF NATURAL GAS 240–243
SECTION 2.—USE OF NATURAL GAS IN THE MANUFACTURE OF LAMPBLACK, ETC 244
SECTION 3.—GAS FROM CRUDE PETROLEUM, PARAFFINE OIL, AND RESIDUUM 244
SECTION 4.—GAS FROM NAPHTHA 245
SECTION 5.—CARBURETTORS 245, 246

CHAPTER IV.—THE USE OF PETROLEUM AND ITS PRODUCTS AS FUEL 247–251
SECTION 1.—THEORETICAL CONSIDERATIONS 247, 248
SECTION 2.—PETROLEUM AS A STEAM FUEL 248, 249
SECTION 3.—PETROLEUM AND ITS PRODUCTS IN THE MANUFACTURE OF IRON 249, 250
SECTION 4.—STOVES 250, 251
SECTION 5.—MISCELLANEOUS APPLICATIONS 251

CHAPTER V.—THE USES OF PETROLEUM IN MEDICINE 252–256
SECTION 1.—THE PHYSIOLOGICAL EFFECTS OF PETROLEUM AND ITS PRODUCTS 252
SECTION 2.—PETROLEUM AND ITS PRODUCTS AS THERAPEUTICS 253
SECTION 3.—PHARMACEUTICAL PREPARATIONS OF PETROLEUM 253–256

CHAPTER VI.—MISCELLANEOUS USES OF PETROLEUM AND ITS PRODUCTS 257–260

CHAPTER VII.—THE INFLUENCE OF PETROLEUM UPON CIVILIZATION 261–280

CHAPTER VIII.—THE BIBLIOGRAPHY OF BITUMEN AND ITS RELATED SUBJECTS 281–301

LIST OF ILLUSTRATIONS.

FRONTISPIECE: A PETROLEUM FIELD (AN ORIGINAL PHOTOGRAPH).

MAP I.—SHOWING THE DISTRIBUTION OF BITUMEN THROUGHOUT THE WORLD 33
II.—SHOWING THE AREAS THAT PRODUCED BITUMEN IN THE UNITED STATES AND CANADA 1
III.—SHOWING THE DEVELOPED OIL FIELDS OF WESTERN PENNSYLVANIA AND NEW YORK 21
IV.—THE VOLCANO OIL REGION OF WEST VIRGINIA 51
V.—THE OIL REGIONS OF KENTUCKY AND TENNESSEE 25
VI.—BITUMEN-PRODUCING LOCALITIES IN SOUTHERN OHIO, WEST VIRGINIA, AND KENTUCKY 24
VII.—SHOWING BITUMEN SPRINGS IN TEXAS AND LOUISIANA 26
VIII.—SHOWING LOCALITIES IN MICHIGAN AND CANADA THAT HAVE PRODUCED BITUMEN 27

CHART I.—SHOWING THE ANNUAL PRODUCTION OF PETROLEUM, AND DEVELOPMENT OF THE INDIVIDUAL DISTRICTS IN THE OIL REGION OF PENNSYLVANIA AND SOUTHERN NEW YORK 149
II.—PROPORTIONAL PRODUCTION OF THE OIL REGION OF PENNSYLVANIA AND SOUTHERN NEW YORK, AND THAT OF THE INDIVIDUAL DISTRICTS 149
III.—SHOWING THE ANNUAL PRODUCTION OF PETROLEUM IN THE OIL REGION OF PENNSYLVANIA AND SOUTHERN NEW YORK, SINCE ITS DISCOVERY, WITH THE VALUES OF THE PRODUCTION IN CURRENCY AND IN GOLD .. 150

PLATE I.—PIECE OF THE HURONIAN SHALE INCLOSING THE ALBERTITE VEIN IN NEW BRUNSWICK 73
II.—PORTION OF THE SURFACE OF A HORSE OF SANDSTONE FOUND INCLOSED IN THE GRAHAMITE VEIN, RITCHIE COUNTY, WEST VIRGINIA 74
III.—PROFILE THROUGH AXIS OF WEST VIRGINIA ANTICLINAL FROM OHIO RIVER TO LITTLE KANAWHA RIVER ... 48
IV.—SECTIONS ON THE OHIO RIVER ABOVE MARIETTA, AT HORSE NECK, WEST VIRGINIA, AND BETWEEN LAUREL FORK JUNCTION AND PETROLEUM, WEST VIRGINIA 49

		Page.
PLATE	V.—VERTICAL SECTION OF WHITE OAK ANTICLINAL, WEST VIRGINIA	50
	VI.—FIG. 1. PUMPING WELL, 1861.—FIG. 2. PUMPING WELL, 1868.—FIG. 3. PUMPING WELL, 1878.—FIG. 4. FLOWING WELL, 1880.—FIG. 5. DRILLING WELL AND FULL STRING OF TOOLS	82
	VII.—GENERALIZED GEOLOGICAL SECTION FROM BLACK ROCK, NEW YORK, TO DUNKARD CREEK, PENNSYLVANIA	45
	VIII.—GENERALIZED VERTICAL SECTION FROM THE TOP OF THE UPPER BARREN COAL MEASURES DOWN TO THE CORNIFEROUS LIMESTONE, TO SHOW THE VARIOUS OIL HORIZONS OF CANADA, NEW YORK, AND PENNSVLVANIA.	46
	IX.—SECTION OF BITUMINOUS ROCKS ON BIGG'S RANCH, SANTA BARBARA COUNTY, CALIFORNIA [FIG. 1, PAGE 21] BITUMEN AT SELENITZA, ALBANIA [FIG. 2, PAGE 32]	
	X.—OLD OIL SPRINGS, PAINT CREEK, JOHNSON COUNTY, KENTUCKY [FIG. 3, PAGE 63.]—SECTION ON LITTLE PAINT CREEK, JOHNSON COUNTY, KENTUCKY [FIG. 4, PAGE 63.]—CROW'S NEST, ON PAINT CREEK, JOHNSON COUNTY, KENTUCKY [FIG. 5, PAGE 63]	
	XI.—SECTION THROUGH SULPHUR MOUNTAIN AND OJAI PLATEAU, VENTURA COUNTY, CALIFORNIA [FIG. 6, PAGE 68]	
	XII.—SECTION FROM BORYSLAW TO SCHODNICA, EAST GALICIA [FIG. 7, PAGE 72.]—SECTION OF VEIN OF ASPHALTUM NEAR HAVANA, CUBA [FIG. 8, PAGE 72] BITUMEN IN ALBANIA [FIGS. 9, 10, 11, 12, 13, and 14, PAGE 73]	
	XIII.—FOUNDATION TIMBERS FOR RIG [FIG. 15, PAGE 79]	
	XIV.—SIDE ELEVATION OF DERRICK AND ENGINE [FIG. 16, PAGE 80]	
	XV.—HORIZONTAL PROJECTION OF DERRICK AND ENGINE [FIG. 17, PAGE 80]	
	XVI.—END ELEVATION OF DERRICK [FIG. 18, PAGE 80]	
	XVII.—INSIDE VIEW OF DERRICK AT NIGHT, SHOWING USE OF TEMPER-SCREW AND DERRICK-LIGHT [FIG. 19, PAGE 81]	
	XVIII.—EIGHT-INCH BIT [FIG. 20, PAGE 81.]—FIVE-AND-ONE-HALF-INCH BIT [FIG. 21, PAGE 81.]—AUGER STEM [FIG. 22, PAGE 81.]—SINKER BAR [FIG. 24, PAGE 81]	
	XIX.—JARS [FIG. 23, PAGE 81.]—ROPE SOCKET [FIG. 25, PAGE 81.]—RING SOCKET [FIG. 27, PAGE 81]	
	XX.—TEMPER-SCREW [FIG. 26, PAGE 81.]—WRENCH [FIG. 28, PAGE 81.]—FIVE-AND-ONE-HALF-INCH REAMER [FIG. 29, PAGE 81.]—EIGHT-INCH REAMER [FIG. 30, PAGE 81]	
	XXI.—TORPEDO BEFORE EXPLOSION [FIG. 31, PAGE 85]	290
	XXII.—CROSS-SECTION OF PUMPING WELL, 1861—WOODEN CONDUCTOR [FIG. 32, PAGE 87.]—CROSS-SECTION OF PUMPING WELL, 1868—CAST-IRON DRIVE-PIPE [FIG. 33, PAGE 87]	
	XXIII.—CROSS-SECTION OF PUMPING WELL, WROUGHT-IRON DRIVE-PIPE, 1878 [FIG. 34, PAGE 87.]—CROSS-SECTION OF FLOWING WELL, 1880 [FIG. 35, PAGE 87]	
	XXIV.—SUCKER-ROD MOVEMENT [FIG. 36, PAGE 88]	
	XXV.—LATERAL VERTICAL SECTION OF CYLINDRICAL STILL [FIG. 37, PAGE 162.]—TRANSVERSE VERTICAL SECTION OF CYLINDRICAL STILL [FIG. 38, PAGE 162]	
	XXVI.—HORIZONTAL SECTION OF CHEESE-BOX-STILL SETTING [FIG. 39, PAGE 162.]—VERTICAL SECTION OF CHEESE-BOX-STILL SETTING [FIG. 40, PAGE 162]	
	XXVII.—SECTION OF CONDENSING DRUM [FIG. 41, PAGE 162.]—SECTION OF STEAM-PIPE FOR STILL HEAD [FIG. 42, PAGE 162.]—DIAGRAM SHOWING ARRANGEMENT FOR DISTRIBUTING DISTILLATES [FIG. 43, PAGE 163]	
	XXVIII.—RAMDOHR'S PARAFFINE FILTERING APPARATUS [FIG. 44, PAGE 174.]—RAMDOHR'S PARAFFINE FILTERING APPARATUS [FIG. 45, PAGE 174.]—RAMDOHR'S CHARCOAL PULVERIZING DRUM OR CYLINDER [FIGS. 46 and 47, PAGE 175]	
	XXIX.—SALLERON-URBAIN TESTER [FIG. 48, PAGE 223.]—TAGLIABUE'S OPEN TESTER [FIG. 49, PAGE 224.]—SAYBOLT'S TESTER [FIG. 50, PAGE 224.]—ABEL'S TESTER [FIG. 51, PAGE 224.]—TAGLIABUE'S CLOSED TESTER [FIG. 52, PAGE 224.]—TAGLIABUE'S CLOSED TESTER [FIG. 53, PAGE 224]	
	XXX.—PARRISH'S NAPHTOMETER [FIG. 54, PAGE 224.]—ENGLER'S TESTER [FIG. 55, PAGE 225.]—ENGLER'S TESTER [FIG. 56, PAGE 225.]—VERTICAL SECTION OF EAMES' PETROLEUM FURNACE [FIG. 57, PAGE 250]	

LETTER OF TRANSMITTAL.

PROVIDENCE, R. I., *October* 6, 1882.

Hon. C. W. SEATON,
Superintendent of Census.

SIR: I herewith submit my report as special agent for collecting the statistics of the mining and manufacture of petroleum for the year ending May 31, 1880.

The statistics of mining were gathered, as stated in the chapter devoted to their consideration, by personal interviews with those parties who handled the oil, and from a careful examination of the localities producing it.

The statistics of manufacture were obtained by means of a printed schedule of questions, which was addressed to each firm or corporation engaged in manufacturing petroleum. The answers to the questions contained in these schedules were consolidated into the separate items as given in the report.

An examination of the literature of petroleum revealed a very large number of articles and references, some of which were of even classical antiquity, but the larger number of which had been published within the present century. Very few bound volumes have been devoted to the general consideration of the subject; and none of these, while each valuable as presenting some of its particular aspects, were to be considered as embracing the results of a comprehensive research with reference to all of its varied details. It was therefore thought advisable to make this report an authority upon the subject of which it treats, as embodying the results of a careful examination of the entire literature of petroleum, as well as a careful use of all other available sources of information. The three aspects of the subject—the natural history, technology, and uses of petroleum and its compounds—were each considered under its several appropriate divisions, these forming the subjects of separate chapters. Each of these several chapters, in turn, represents a special research and constitutes a separate independent essay. This arrangement, it is hoped, will facilitate the use of the report for all the varied purposes for which it may be sought. Any further details will, I think, be readily apparent upon an inspection of the work itself.

I wish herewith to express my great obligations to all of those from whom I have solicited assistance in the collection of the statistical material for this report. Without the cordial co-operation of the officers of the great corporations which produce, distribute, and manufacture petroleum, together with a very large number of private individuals, my labors would have been in vain; and I make this statement, appreciating the fact that this assistance in a great number of instances involved a large amount of perplexing labor, gratuitously rendered from an appreciative estimate of the work upon which the Census Office has been engaged. When hundreds of persons throughout the country, engaged in the production, transportation, and manufacture of petroleum, uniformly rendered all of the assistance in their power, it is both difficult and unfair to make distinctions. I had rather repeat what I have said privately: that the patience, forbearance, and uniform courtesy with which I have been met by all parties representing the petroleum interest has been extremely gratifying.

In securing information other than statistical I am under great obligations to Professor J. P. Lesley and his assistants, of the second geological survey of Pennsylvania, particularly Mr. J. F. Carll, of Pleasantville, Pennsylvania. Beside the obligation involved in extensive quotation from Mr. Carll's published reports, his personal assistance in the way of introduction to both persons and places throughout the oil-producing section proved invaluable. I feel that whatever value the report may possess in reference to the geology of West Virginia is due to Mr. F. W. Minshall, of Parkersburg, West Virginia, who, in addition to furnishing the geological sections, rendered me further assistance in introductions and information involving a long correspondence.

In collecting the statistics of foreign localities I am under special obligations to Mr. Boverton Redwood, of London, England; Mr. E. W. Binney, of Manchester, England; Dr. Ferd. Roemer, of Breslau, Silesia; M. P. E. De Ferrari, of Genoa, Italy; Rev. J. N. Cushing, of Prome, Burmah; Dr. James Harris, of Yokohama, Japan; and William Brough, esq., of Franklin, Pennsylvania. To all of these gentlemen I am indebted for the careful collection of statistics and private correspondence.

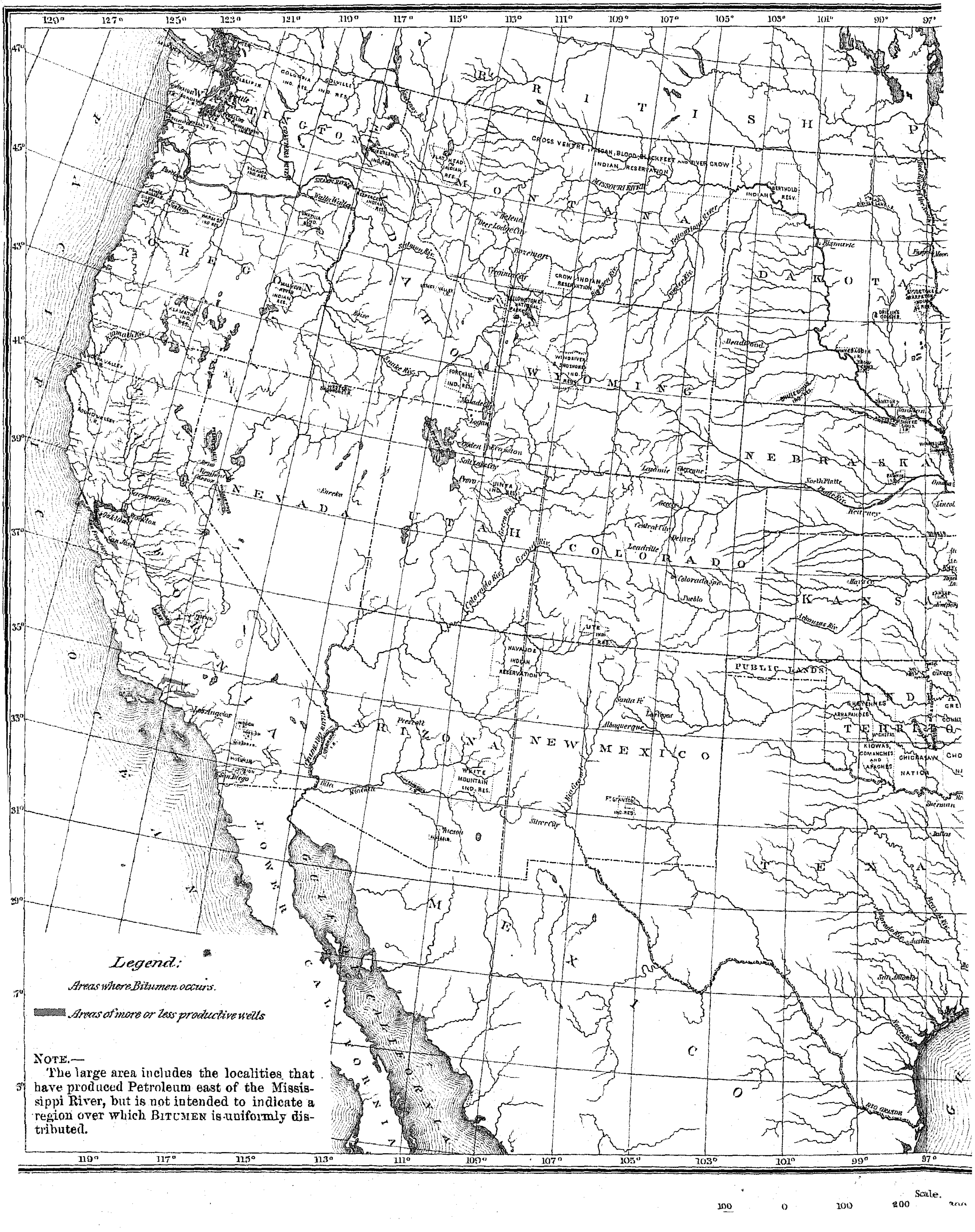
The extent and value of my researches upon the literature of petroleum have been largely due to the assistance that I have received from the librarians of Brown University, Harvard College, the Boston Public Library, and the American Philosophical Society, and especially to Professor J. D. Whitney, whose valuable private library was generously placed at my disposal. With the exception of a few East Indian publications, these libraries enabled me to verify all of the references with which I came in contact.

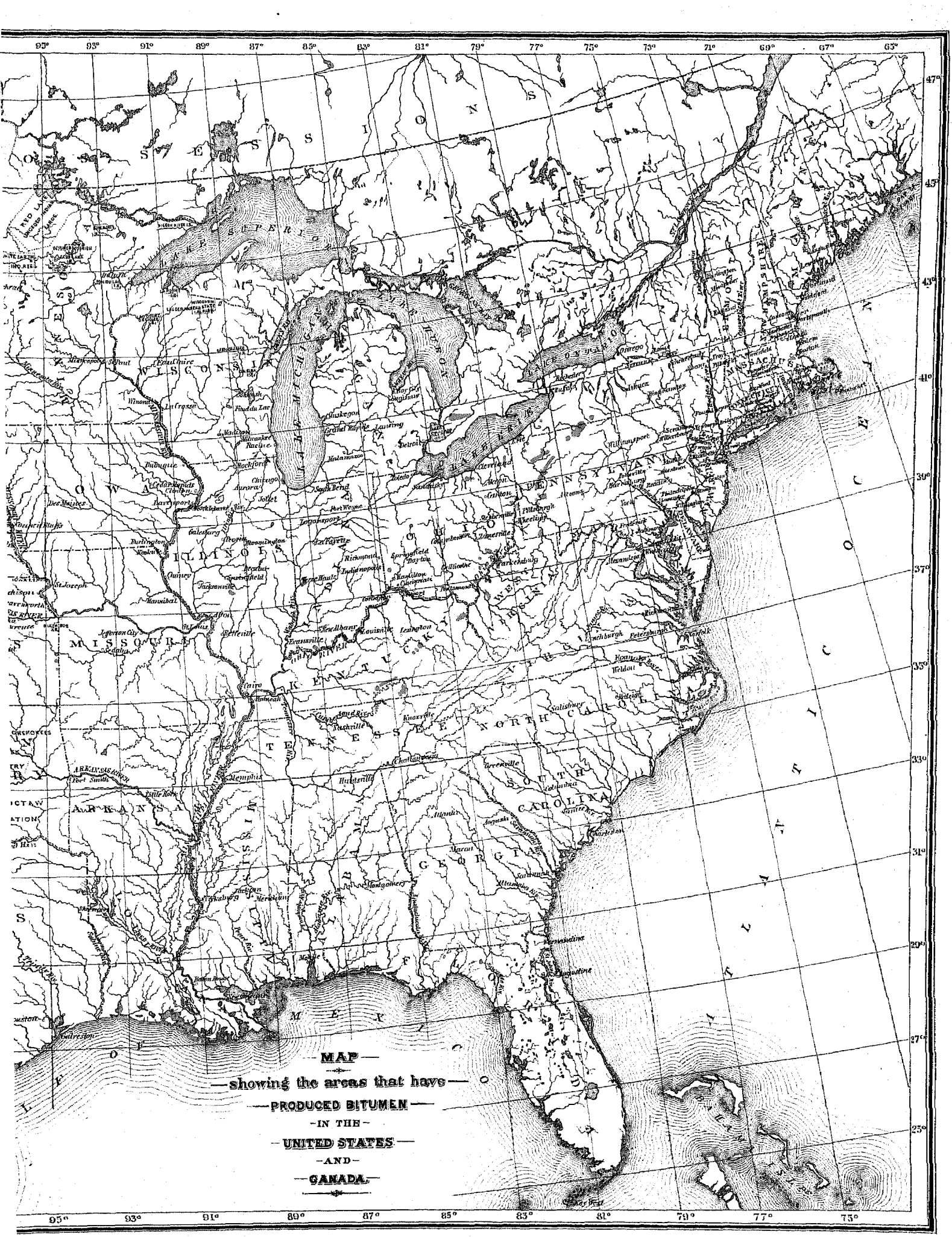
Mr. J. C. Welch, of New York, whose statistics and reports bear such a deservedly high reputation for reliability, has rendered me much varied and valuable assistance not otherwise available.

I wish further to express my obligations to Miss Laura Linton, who has assisted me in the preparation of this report, and to whose varied accomplishments I am indebted for many of the translations and illustrations that add completeness and embellishment to the work; also to the officials of the Census Office, to whose uniform courtesy I am indebted for assistance in a somewhat arduous and perplexing undertaking.

Very respectfully,

S. F. PECKHAM,
Special Agent.


Legend:
Areas where Bitumen occurs.
Areas of more or less productive wells
NOTE.—
The large area includes the localities that have produced Petroleum east of the Mississippi River, but is not intended to indicate a region over which BITUMEN is uniformly distributed.
BRITISH POSSESSIONS
WASHINGTON
OREGON
IDAHO
MONTANA
DAKOTA
WYOMING
NEBRASKA
NEVADA
UTAH
COLORADO
KANSAS
CALIFORNIA
ARIZONA
NEW MEXICO
INDIAN TERRITORY
TEXAS
MEXICO
LOWER CALIFORNIA
GULF OF CALIFORNIA
PUBLIC LANDS
CROSS VENTRE, PIEGAN, BLOOD, BLACKFEET AND RIVER CROW INDIAN RESERVATION
CROW INDIAN RESERVATION
NAVAJOE INDIAN RESERVATION
WHITE MOUNTAIN IND. RES.
UTE INDI. RES.
YELLOWSTONE NATIONAL PARK
CHEYENNES ARRAPAHOES
KIOWAS, COMANCHES AND APACHES
CHICKASAW NATION
Missouri River
Yellowstone River
Snake Riv.
Salmon Riv.
Colorado Riv.
Grand Riv.
Green Riv.
Rio Grande
Arkansas Riv.
Platte Riv.
Helena
Bozeman
Virginia City
Deer Lodge City
Bismarck
Deadwood
Salt Lake City
Ogden
Evanston
Provo
Eureka
Carson
Sacramento
Oakland
San Jose
Stockton
Los Angeles
San Diego
Laramie
Cheyenne
Greeley
Central City
Denver
Leadville
Colorado Spr.
Pueblo
Santa Fe
Las Vegas
Albuquerque
Prescott
Silver City
Tucson
Sherman
Dallas
Austin
San Antonio
Omaha
Lincoln
North Platte
Portland
Salem
Walla Walla
Boise
Seattle
Scale.
100 0 100 200


MAP
showing the areas that have
PRODUCED BITUMEN
IN THE
UNITED STATES
AND
CANADA.
400 500 600 Miles.