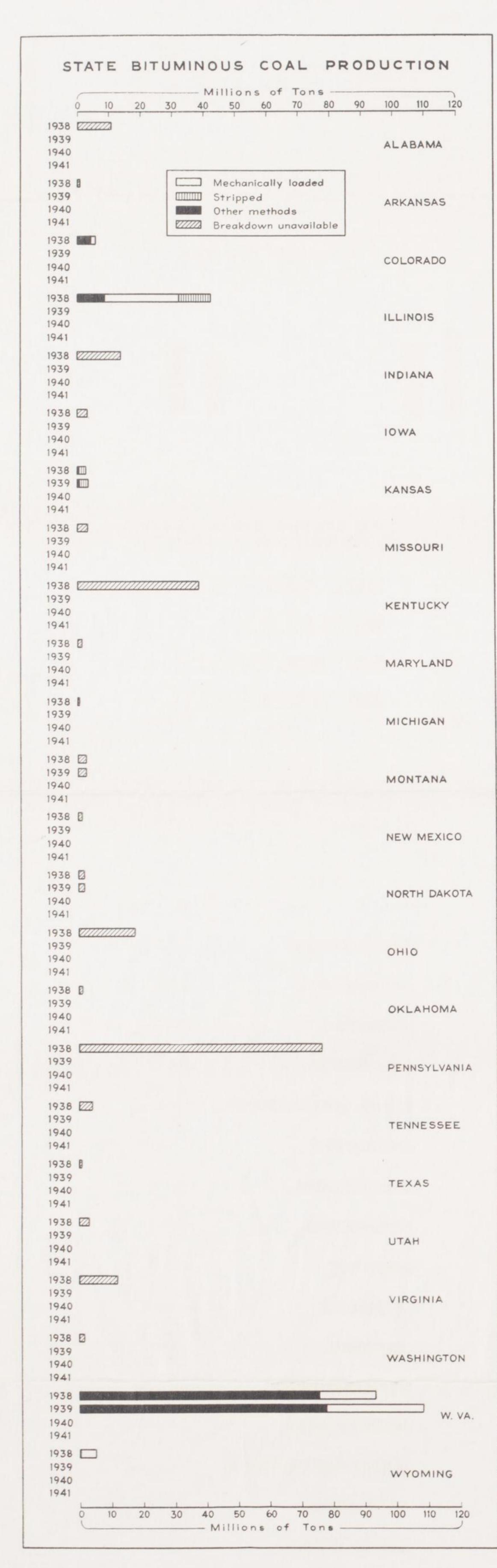
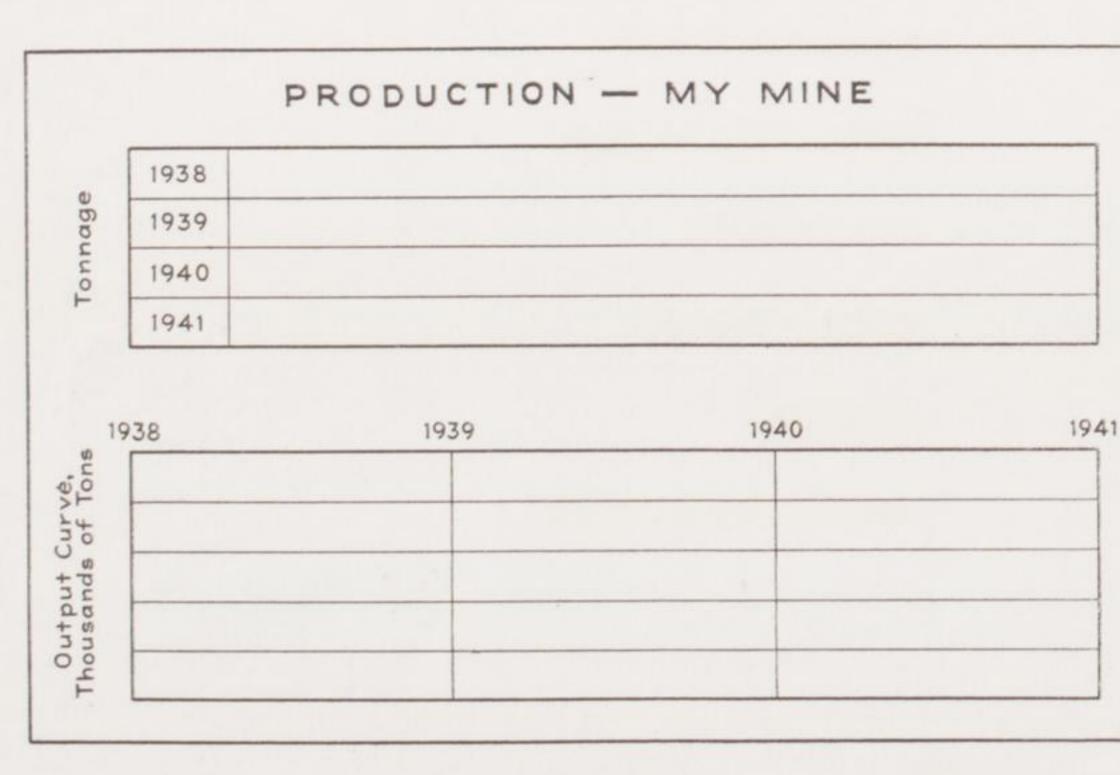
# U. S. BITUMINOUS PRODUCTION Mechanically by other methods Breakdown not yet available





# 130 CUES TO COAL-MINING PROFITS

other arrangements been made? 6. Labor is expensive. Have requirements been estimated and the work planned to avoid waste of time? 7. Can present supervisors handle construction or are new men needed? 8. Have provisions been made for power shovels, scrapers, tamping bars, etc.? connections and have self-contained power 40. Is proper stemming available and units, possibly useful in future building have patent tamping plugs been studied? or emergency, been studied?

ment, including a crane, derrick, etc., also proper explosives and drilling patterns 10. If excavation is done by the com- tion men, loaders and bosses, as well as signals, electric switchthrowers and simipany, has future usefulness of such equip- actual broad-scale tests? ment as draglines, bulldozers, scrapers, 43. Have carbon-dioxide, air and hy- 70. Has gathering - locomotive equipetc., in road- and dam-building, ditching, draulic coal breaking been surveyed from ment been studied for such items as: clearing, etc., been considered in specify- the viewpoint of shooting on shift, pulling

11. Is the company prepared to sink new shafts or slopes? slope conveyors and hoists been investi- shooting in order, sequence delays, etc.?

with loading machines and conveyors to ing aids provided? more continuous sinking and facilitate them underground when permitted, etc.? loading trucks or other disposal units? 15. Would conveyors on the surface be explosives and detonators? a cheaper spoil-disposal medium? 16. Have the proper explosives been selected and facilities provided for han-17. Have provisions been made for han-

18. Can construction materials be obtained locally as needed or must they be possibilities of: 19. Can rock at hand be used in construction and is purchase of equipment to prepare it advisable?

20. Have mixers, compressors, fuel storage and accessories been provided 21. Have provisions been made for a forge, tool and repair shops, etc? 22. Have provisions, such as wash- and change-houses, been made for the comfort and convenience of workers? 23. Have provisions been made for safety and first-aid?

### MINING METHODS

24. Is the mining plan regularly checked to ascertain, for example: (b) If changing equipment or conditions

necessitate or permit changing place widths for greater efficiency? (c) If changing to angle working would ease haulage, equipment moves, etc.? (d) If revising projections would shorten hauls, reduce grades, etc.?

25. Have the possibilities of full-retreat mining been fully explored? 26. Have active workings been concentrated in the smallest possible area? 27. Have provisions been made for with the least use of timber? facilitating sealing of old works, erection termine possible savings by:

of explosion barriers, etc.? nage to the last in working sections and on final retreat over the mine? for quick development for sudden demand for temporary support at the face been or difficulty in regular sections?

### CUTTING AND DRILLING

31. If loading or conveying equipmen is planned, is present cutting and drilling equipment adequate or should new units be purchased to effect greater cost

32. If present cutting equipment lacks capacity, has study been given to such possible remedies as: (a) Longer bars to raise tons per place?

(b) Increasing feed speed? (c) Changing chains or bit positions, tipped or patent bits and other means o raising cutting speed and reducing bit set-(d) Improved shortwall trucks to cut loading, unloading and moving time? (e) Purchase of new shortwalls with the above and other advantages?

(a) Quicker moving and setting up, plus other modern characteristics? (b) Cutting or cutting and gobbing impurity bands, rash, drawslate, etc.?

MECHANICAL-CLEANING GROWTH

IN THE BITUMINOUS INDUSTRY

(Estimates for 1937 and 1938)

# tool carts, including grinders?

39. Are face-preparation men furnishe with necessary tools, such as bugdust 41. Have machines for filling tamping 9. Have provisions been made for re- bags been investigated? ceiving and storing material and equip- 42. Has investigation to determine 68. Has dispatching been studied for

deep cuts, raising lump and loadability and other advantages? 44. Has hole burden been equalized and 12. Have the relative long-time costs of does each hole relieve the next through

45. Are good shooting cables, with reels,

13. If slopes are chosen, has sinking efficient shotfiring units and similar shoot-46. Are safe and efficient provisions 14. Would spoil-storage bins insure made for transporting explosives, storing 47. Do shotfirers have good carriers for

48. Since mechanization reduces labor costs per ton 25 to 75 per cent, has investigation been made of the cost-reduction

ers, hand-loaded conveyors and scraper (b) Mechanizing the lift with mobile loaders, self-loading conveyors and scrapers, and similar equipment?

49. Have new developments in equipment been studied from the standpoints (a) Replacing other mechanization units with mobile machines? (b) Replacing old machines with new to

raise output and cut maintenance? (c) Using mobile loaders in connection with face and room conveyors? (d) Installing self-loading conveyors 50. Has special equipment, such as hand- or self-loading conveyors, scrapers and mucking machines, been considered for entry-driving, especially in thin coal (a) If number of places per section fits where rock must be taken for height? the operating cycle and capacities of the 51. Are sufficient spare mechanization units available for replacements in case

### without raising investment? ROOF SUPPORT

of breakdowns, overhauls, etc.?

53. Has roof been thoroughly investi gated and the material tested to determine the maximum width of opening possible 54. Has timbering been studied to de-

(a) Treatment to prolong life? 55. Have the possibilities of steel roof

30. Is a special coal reserve provided and timber jacks, adjustable props, etc., 56. Are timbermen supplied with the veyed from the viewpoints of: proper tools, trucks and the like?

57. Have general transportation prac tices been surveyed to see if efficiency can be raised by such measures as: (a) Relocating the opening or sinking a

conveyor slope, driving a rock tunnel, etc., to replace slope or shallow- or mediumdepth shaft hoists? (b) Relocating inside hauls to shorten distances and reduce grades? (c) Shortening total hauls by rock tunnels to pitching seams, new outside hauls,

erection of bridges, etc.? (d) Using aerial tramways across broken 58. Have storage bins to reduce dumping delays and keep coal flowing to the

mounted cutters been studied from such and trip-makers used to speed hoisting? face standby, offer more efficiency? 60. Have skips been considered to raise 83. Are standby fan drives provided? shaft capacity and permit the use of larger 84. Are fans equipped with alarms or 61. Have overturned cages been con- 85. Is the proper equipment for gas sidered to permit use of larger solid cars? detection and air sampling available?

surveyed to see if a different type will

relay practices relieve main lines? 67. In building main and secondary

(b) Adequate drainage, proper subgrade and ballast, proper clearances? (c) Heavier rail, welded joints, steel ties or welded cross members at intervals to maintain gage, etc.? (d) Treatment to prolong tie life and cut replacement cost and labor? (e) Long-radius curves, super-elevation; alloy frogs, crossings, etc.; welding and hard-surfacing of parts, etc.? (f) Adequate roof support, such as

proper haulage control? included suggestions from face-prepara- 69. Have block signals, switch-position lar haulage aids been investigated? (a) Locomotive weight or ability to handle larger cars or trips?

treated timber, concrete, masonry, steel,

guniting, hitch-drill bars, etc.?

(b) Reducing (or increasing) speed for 71. Have the possibilities of battery locomotives, particularly in gathering and car-changing, been investigated? 72. Has track in working sections been studied from the standpoints of:

(a) Weight of rail, particularly with hea-

vier requirements? (b) Use of steel ties for quicker laying and saving in height? (c) Raising switchlaying speed by steeltie switches, sectional switches, etc.? (d) Use of mine-car transfers and similar devices to speed car-changing. (e) Use of stub tracks, double room tracks, room sidings, connecting tracks through crosscuts and similar means of reducing car-changing time?

73. Are tracklayers supplied with tool carts and such tools as light-weight benders and punches, bars, jacks, etc.? 74. Are locomotives supplied with jacks, rerailers and the like? 75. Mine cars materially influence cost and performance figures; has consideration, therefore, been given to:

(a) The increased capacity without material changes in dimensions provided by (b) The possibilities of raising loadingmachine output by using a larger car to cut number of changes? (c) The savings in maintenance and power and the smoother operation and safety provided by improved construction and accessories, such as welding, highstrength and corrosion-resisting alloys, anti-friction bearings, special axle and

wheel metals, high-strength hitchings, au-

tomatic couplers, spring draft and buffing

76. Where cages, etc., limit car size, have large cars, particularly the drop-52. Has study been given to working bottom type, and underground transfer more than one shift to increase tonnage hoppers been considered for use behind 77. Has a survey been made to see if the theoretical advantages of conveyor My mine transportation can be realized in:

gears, hydraulic brakes, etc.?

(a) Room transportation. where taking top or bottom frequently may deterioration been investigated?

78. Has use of car- and trip-spotting hoists at conveyor-loading points and elsewhere been investigated? 28. Is provision made to keep up ton- (b) Use of masonry, concrete, granite, 79. Has rubber-tired haulage as a means steel and concrete, etc., for long life? of increasing loader output by shortening surveyed from the viewpoints of:

80. Have ventilation practices been sur-(a) Increasing airway area to cut velocity and resistance and raise flow? (b) Sealing off old sections, driving new airways to cut travel, etc.? (c) Sinking shafts or making new openings at the back end of the property to establish one-way air travel?

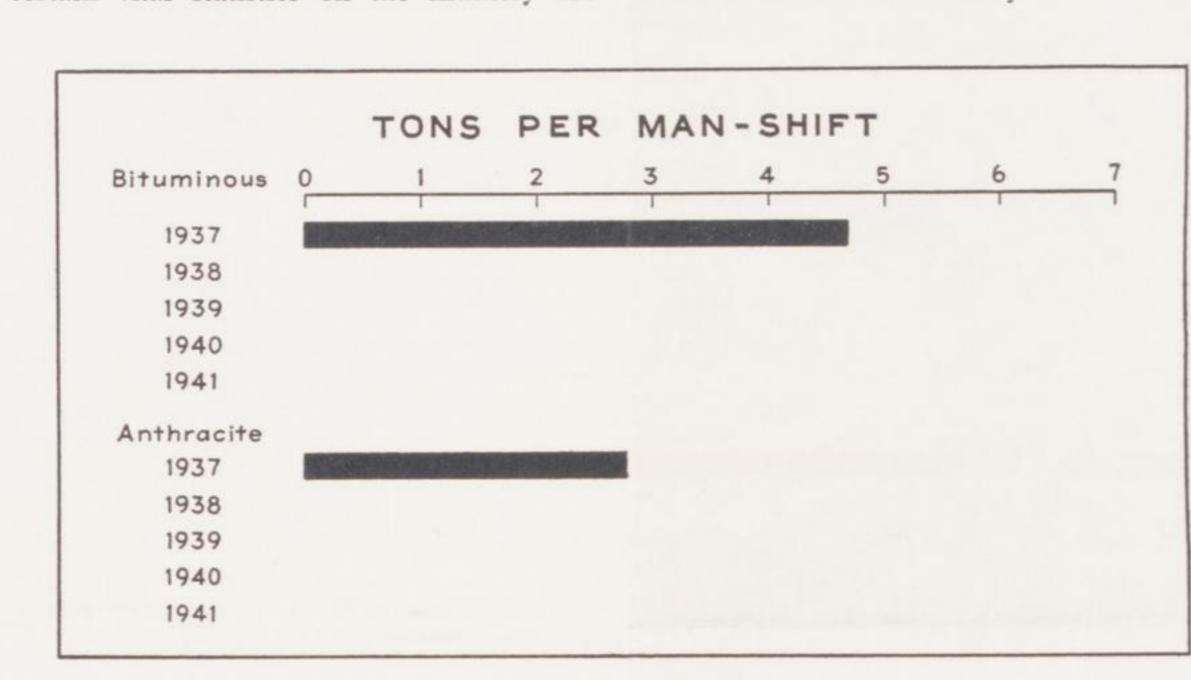
(d) Using more overcasts to eliminate (e) Employing air locks, automatic doors, etc., for greater efficiency? (f) Better timbering of airways and regular cleaning to eliminate restrictions, reduce turbulence, etc.? (g) Use of vanes, curves, etc., to prevent

turbulence and loss of power where direc- 90. Have gathering pumps been studied (h) Installation or increased use of brat- portability, reliability and efficiency? tice lines, auxiliary tubing blowers, etc., 91. Are suitable and adequate quantiin carrying away gas, smoke and dust. 81. Will a new fan supply as much or valves, strainers, etc., available? more air with less power? 59. Are car feeders, automatic cagers 82. Will shaft-bottom fans, plus a surbeen investigated?

GROWTH OF SMALL STOKERS

(Factory sales, Classes 1, 2 and 3 units, up to 300 lb. per hour)

other signals to show pressure drop? 93. Have studies been made of: (a) Building a plant and discontinuing



### TONS PER MAN-SHIFT BY STATES

		1937	1938	1939	1940			1937	1938	1939	1940
ALA.	Deep	2.74	2.56			ž	State	3.17			
	Strip	2.75	2.96			ż	My mine				
	My mine						Deep	5.50			
ARK.	Deep	2.58				Z.	Strip	13.13			
	Strip	6.88					My mine				
	My mine						Deep	4.23			
COLO.	State	4.21	4.14			OHIO	Strip	10.57			
	My mine						My mine				
ILL.	Deep	6.18	6.90			i	Deep	2.77			
	Strip	17.40	15.00			OKLA.	Strip	12.51			
	My mine					0	My mine				
IND.	Deep	6.86					Deep	4.13			
	Strip	14.46				PA.	Strip	8.15			
	My mine						My mine				
IOWA	Deep	2.64				ż	State	3.17			
	Strip	7.33				TENN.	My mine				
	My mine					AS	State	5.59			
KAN.	Deep	2.04	3.90			TEXAS	My mine				
	Strip	11.90	17.08				State	5.88			
	My mine					UTAH	My mine				
KY.	State	4.41				1	State	4.18			
	My mine					¥	My mine				
MD.		3.25				SH.	State	3.40	3.62		
	My mine		Į.			WAS	My mine				
MICH.	State	2.88				VA.	State	5.00	5.19	5.49	
	My mine					3	My mine				1
Mo.	Deep	1.91	1.72				Deep	6.04	6.90		
	Strip	11.73	13.73			WYO.	Strip	9.55	10.00		
	My mine					3	My mine				
MONT.	Deep	6.52				ė	Deep	2.58			
	Strip	76.70				Anth.	Strip	6.76			
	My mine					PA.	My mine				

(b) Room- or panel-entry transportation, 86. Has conditioning air to reduce roof power purchases or shutting down an old

87. Has the dewatering situation been (c) Use of the hitch drill to eliminate car change and providing the advantages

(a) Establishment of sumps at strategic locations to permit use of ditches, shorten pumping distances, etc.?

(b) Provisions for sealing, dams, emergency flood-control doors, etc.? (c) Boreholes, new openings and other short routes to the surface? (d) Use of rock-tunnels, inclined boreholes, ditches, siphons, etc.? (e) Use of deep-well turbine pumps? 88. Have acid and abrasive questions

automatic priming, been investigated?

been studied to determine: (a) If special corrosion- or abrasionting of motors to loads, capacitors, etc., oil houses and the like? resisting metal, wood, asbestos-cement to improve power-factor? fiber or rubber pipe should be used? (i) Reduction of losses by higher volt-(b) If special fittings are required? ages on larger motors? (c) If special corrosion- or abrasion-re-(j) Ample-size conductors for both pressisting pump materials are required? 89. Have the possibilities of semi- o

circuit protection, etc.? (k) Efficient grounding of equipment (1) Use of modern starting and control equipment, indicating and recording meters and other accessories? to see if they yield the maximum 95. In d.c. distribution and utilization has consideration been given to: ties of accessories, such as foot and check (a) Regular checks, with instruments, of voltage, bond condition, etc.? 92. Has using mine water for sprinkling

plant and buying energy?

the viewpoints of, for example:

(a) A higher incoming voltage?

94. Has a.c. service been studied from

(b) Consolidation of receiving points

(c) The merits of limiting to avoid pen-

(d) Raising a.c. distribution voltage to

(e) Protection of lines and equipment

(f) Use of a.c. instead of d.c. for opera-

4,000 or 6,600 to reduce conductor size, cut

to cut energy cost?

for central metering?

alties from excessive peaks?

losses and increase efficiency?

(b) Reduction of d.c. circuit lengths by substations underground near load centers, use of boreholes, etc.? (c) Portable substations underground (d) Replacement of present conversion units with more efficient equipment, such as mercury-arc rectifiers? (e) Making substations fully automatic or automatic on the d.c. side?

j) Use of separate positive and return

spreading demand and preventing service

(m) Vulcanizing trailing cables? (o) Fusing of cables, grounding of ma-(q) Use of modern starting equipment etc.?

96. Is care used to apply the proper 97. Have such motor characteristics as 109. Is first-aid material suitable, sufimproved insulation, anti-friction bear- ficient and handy to working sections? ings, fan-cooling, splash-, dust- and explosion-proof construction, improved lubrication, etc., been investigated?

with necessary protection?

### MAINTENANCE

98. In setting up maintenance, has consideration been given to: (a) Regular inspections of equipment and such auxiliaries as electrical circuits and controls, wire rope, etc.? (b) Regular equipment overhauls-elec-

tric on an insulation-resistance basis; machinery, ropes, etc., on a tonnage or time basis; and the like? (c) Study of quantity and nature of repair work to see if heavy or complicated jobs should be sent out or equipment bought to handle them? (d) Whether auxiliary repair shops near the workings are advisable? (e) Whether small stocks of parts should be kept on working sections? (f) Adequate pit and crane facilities, ample tools and tool cars, etc.? (g) Special lubricating trucks; adequate,

99. Are the advantages being realized of such new developments as: (a) Electric welding and gas welding and cutting in such work as cutting, flame hardening, general welding, hard-surfacing, tire-filling etc.?

efficient lubricators, etc.?

(b) Cutting and welding at the face or (c) Piping of acetylene and oxygen from central points for more efficiency? (d) Welding or metallizing to build up or reclaim machine and equipment parts, shafts and axles, flights, etc.? (e) Use of high-strength corrosion- or wear-resisting metals for greater strength and longer life. (g) New insulating materials, such as asbestos and fiber-glass?

100. Have equipment and parts inventories been studied to determine: (a) If equipment standardization will cut investment in inventory? (b) If close sources and good transportation will permit carrying a smaller volume of parts and supplies? 101. Do records covering receipt and

issuance of supplies readily show: (a) Cost and quantity each item received, issued and on hand at all times? (b) Issuance by machines or machine groups or mining or surface accounts? (c) If abnormal quantities are going to specific machines or operations? 102. Are suitable cranes, derricks, un-(b) Replacing or rebuilding existing loading platforms, etc., available for hansteam-raising and/or generating equipment dling heavy machinery and materials? such modern preparation aids as: 103. Are the necessary racks, sheds, etc.,

provided to protect steel, timber, heavy parts, etc., and facilitate issuance? 104. Has consideration been given in design of supply houses, to: cess for handling materials? (b) Good general and local lighting? (c) Proper bin design, including rotat-

ing and locking types as needed? (d) Sectionalizing to permit grouping related classes of materials? 105. Are special storage houses properly designed from the standpoints of efficiency and safety—safety in the case of powder magazines, for example, and (h) More synchronous motors, better fit- both safety and efficiency in the case of

106. Does the safety program contemplate such steps as: (a) Employment of a safety engineer?

(b) Regular checking for hazards? (c) Enlistment of employee cooperation and organization of safety groups? (d) Education of employees and training in mine-rescue and first-aid? (e) Enlistment of supervisory coopera-(f) Offering of incentives to bosses and men for good records? (g) Combination time-clock report of

107. Have surveys been made of the possibilities of protective measures such (a) Thoroughly educating men in how to detect roof, rib and face hazards?

hours worked and safety record?

(b) Systematic timbering and the use of

(d) Machinery guards, guard rails and (e) Better ventilation and increased use lights, explosives and blasting devices, etc.? f) Sprinkling to allay dust? goggles, gloves, safety belts, etc.? (i) Proper fire-extinguishing equipment

trolley and conductor guards, rubber mats, providing control of starting and running (k) Safety lamps and methane and noxious-gas indicators and alarms? 108. Is rescue equipment (masks, oxy-

gen apparatus, life lines, etc.) provided?

### 110. Have markets and present prepa-

(a) If screening equipment provides the required accuracy and flexibility? (b) If facilities for removing degradation are adequate? (c) If screening and crushing equipment would assist in meeting the growing demand for small sizes and stoker coal? (d) If dedusting screens are necessary for better screenings and stoker? (e) If mixing equipment should be in-

stalled or revised for greater flexibility in (f) If special blending equipment, including storage bins, proportioning gates or feeders, etc., should be installed for (g) If special crushing or other facilities are required for meeting seasonal excesses in certain sizes?

(h) If present picking facilities can turn out a satisfactory product? (i) If mechanical cleaning of certain sizes or a range of sizes would result in sibilities of equipment such as small draga cleaner and more uniform fuel to retain lines, tractor-powered scrapers, etc., in or extend markets? (j) If mechanical cleaning can be ex- road-building and miscellaneous dirttended to larger sizes to reduce cleaning moving? cost and promote uniformity? (k) If mechanical cleaning is adopted, dozers and similar equipment being realwhether washing, dry-cleaning or a com-(1) If raw-coal storage and blending will

raise cleaning efficiency and insure continuous plant operation? (m) If an adequately staffed laboratory will assist in satisfying customers by better (n) If trademarking by color or labeling 111. Has consideration been given to

increasing recovery by: (a) Crushing and re-treatment of pickings and cleaner middlings? (b) Reclamation and/or beneficiation of slurry by settling equipment, classifiers, continuous centrifugal equipment, flotation cells, tables, etc.? (c) Installation of special cleaners to re-

cover coal from mine slate? (d) Installation of proper scale and conveyor-weighing equipment? 112. In washing, has consideration been given to freeze prevention and/or increas-

ing B.t.u. content by: (a) Special dewatering screens with or without high-velocity cold air for addi-(b) Calcium chloride and other materials to prevent freezing? (c) Continuous centrifuges, filters and other mechanical dryers? (d) Heat-drying equipment-kiln- or sintering-type dryers, vertical drying shells, screen-type heat dryers, etc.? 113. Has consideration been given to

(a) Dustless treatment by chemicals, emulsions, oils, waxes, etc.? (b) Tramp-iron magnets and pulleys? (c) Pick breakers; stoker sizers? (d) Special metals and alloys to reduce (e) Retractile picking tables, chain-mat rescreening conveyors, shaking distribut ing chutes, suspended screen drives, special screen suspensions, etc.? (f) Mercury-vapor, fluorescent, "dayblue" and other special picking lights? (g) Improved loading equipment-box-

### REFUSE DISPOSAL

(h) Dustproof plant construction?

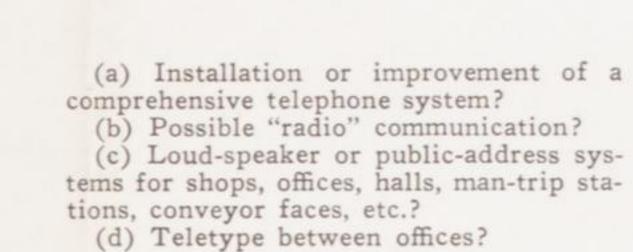
car loaders, belt and resceening booms

chutes and storage conveyors for car-

114. Has consideration been given to special provisions for handling mine slate, ncluding special openings or hoists, storage tracks, dumps, loading hoppers, etc.? 115. Has a study been made of various surface-disposal methods, such as: (a) Motor trucks to permit, if desired, use of refuse in fills, roads, etc.? (b) Modern larry equipment for lower costs over cars and locomotives, etc.? (c) Aerial tramways, particularly in rough country or where large quantities must be taken some distance?

use as mine ballast or in other ways?

time- and money-saving possibilities of:



118. Has illumination been studied to (a) Savings by better miner's lamps, paricularly the electric type? (b) Floodlighting of face operations?

ing for headings, shaft and slope bottoms of shops, supply houses, preparation plants, first-aid rooms, meeting halls, offices, etc.? (e) Improved picking lights? (f) Proper floodlighting of yards, grounds and plant for night operation? (g) Adequate supplies of extension

cords, battery lights and the like?

### STRIPPING

119. In specifying new strippers, have ration practices been studied to determine: the possibilities been studied of: (a) Two smaller shovels instead of a large one for greater flexibility and decreased likelihood of complete stoppage (b) A shovel-and-dragline combination for tandem operation? (c) A smaller shovel with a stacker for handling the spoil? (d) Large draglines for stripping heav-

> (e) "Knee-action" and other late shovel 120. Is it possible to increase capacity (a) Counterbalancing the hoist, use of larger light-weight dippers or buckets,

(b) Increasing swing or hoist speed? (c) Installation of draglines to handle part of the overburden? 121. Has a study been made of the pos-

assisting in box cuts, ditching, dam- and 122. Are the full advantages of bullup, grading, cleaning coal, etc.?

123. For overburden drilling, has a study been made of the relative merits of: (a) Modern well-type drills? (b) Vertical auger and rotary drills or combinations with well drills? (c) Sidewall drills, including types for

124. Has blasting been studied from the viewpoints of such questions as: (a) The relative merits of blasting powders, high explosives and liquid oxygen; splitting charges in holes, etc.? (b) Revisions in drilling patterns including, with sidewall drills, long and short holes, double-decking, etc.? 125. Have coal-loading practices been

surveyed from such standpoints as: (a) Use of special dippers or special loaders-thrust, "knee-action," etc.? (b) Possible adoption of the underground-type loading machine? (c) The relative merits of hand work, bulldozers, power-operated sweepers, etc., in coal cleaning? (d) The relative merits of air drills and vertical augers for shotholes?

(e) Use of channeling machines? 126. Has the general transportation picture been surveyed to determine if: (a) Automotive haulage should be adopt-

(b) If, in case rail haulage is retained, it should be main-line only, with automo-(c) If rail haulage should be electrified? 127. In automotive transportation, has consideration been given to:

(a) The relative merits of straight trucks, with or without special bodies, and tractors and trailers? (b) Replacement of small trucks or trailers with larger equipment? (c) The feasibility of a combination of (d) The possibilities of diesel oil, butane and other new fuels? (e) The advantages of better roads, such

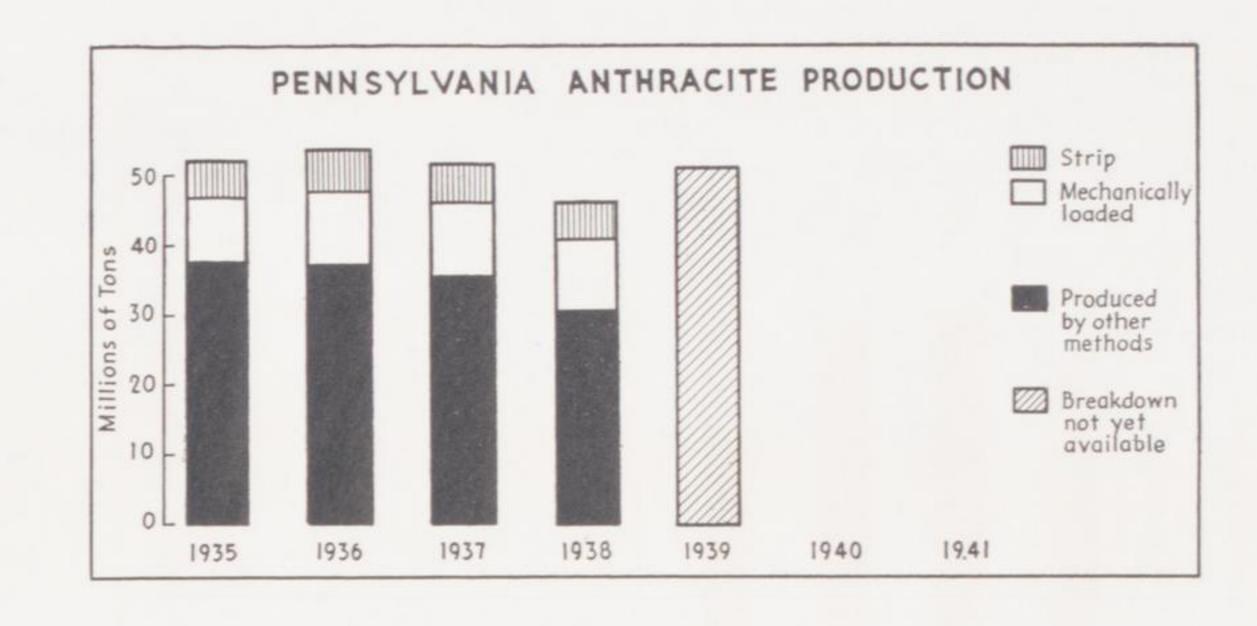
as concrete loaded-truck routes? 128. Is full advantage taken of ditches, dams, dikes, etc., for keeping water out of 129. Has study of pit dewatering in-

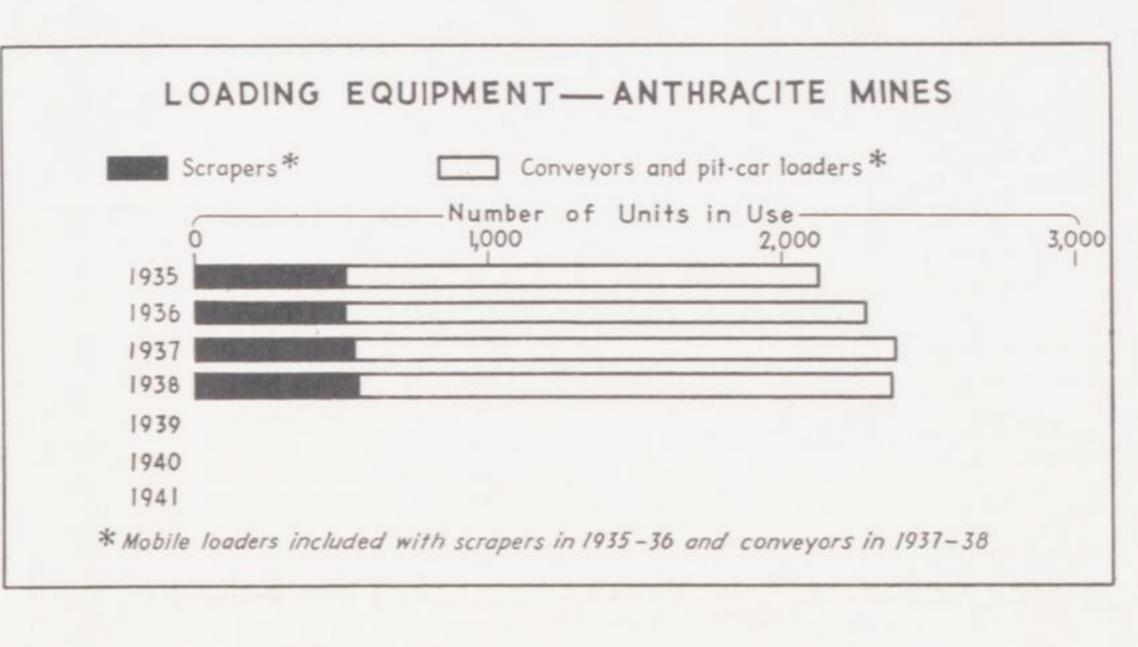
cluded such considerations as: (a) Changes in cut direction, leaving openings in the spoil and similar steps to facilitate natural drainage? (b) The relative merits of gas and electric portable pumps; hose vs. pipe for discharge lines, etc.? (c) Proper spotting of semi-permanent and permanent pumping stations? 130. In the power field, has thought

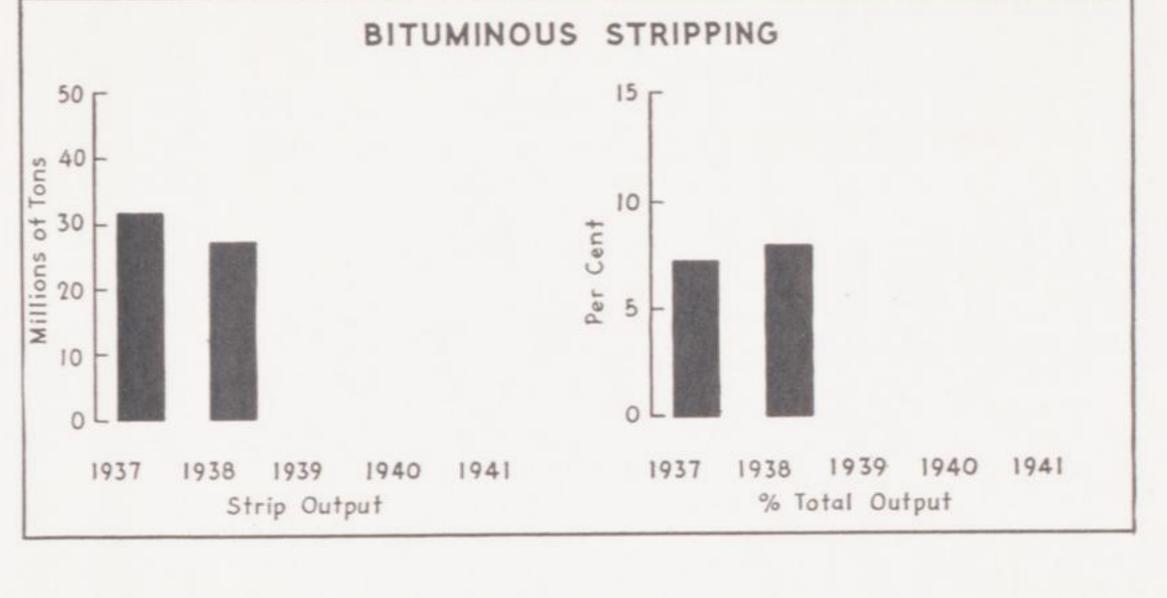
(a) Use of internal-combustion engines

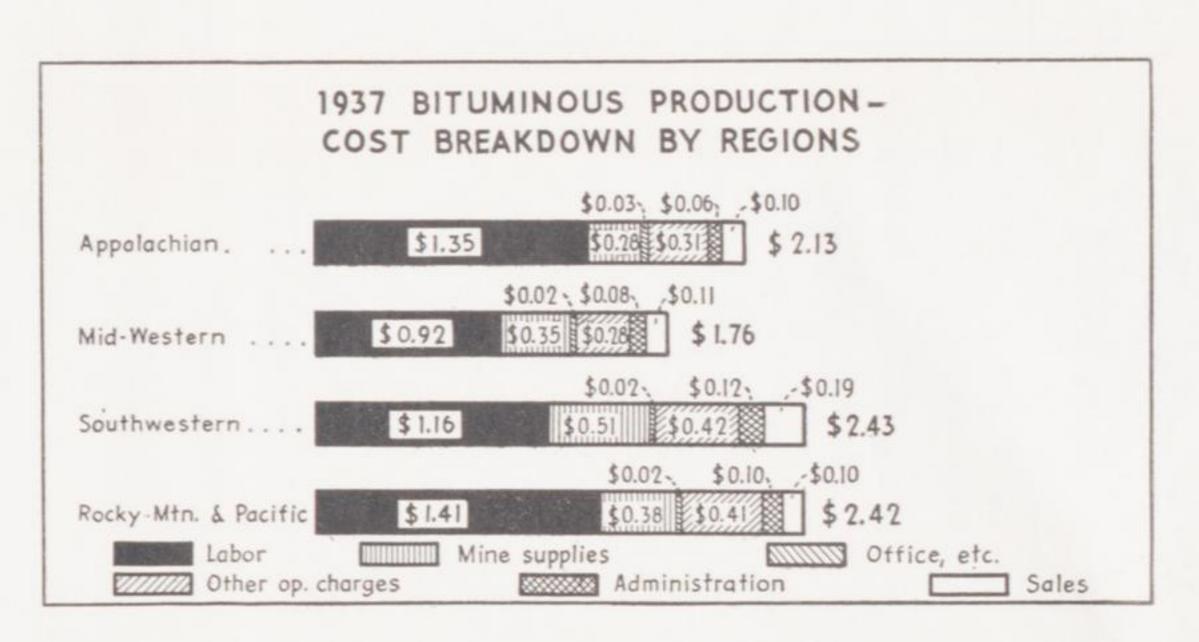
on equipment which is moved frequently, used in isolated sections, etc.? (b) The relative merits of the groundcable and pole-line-and-lateral systems of supplying pit power? (c) Proper control and protective equipment, including switch houses or boxes, junction boxes, cable connectors, fuses, circuit breakers, oil switches, grounding

been given to such items as:

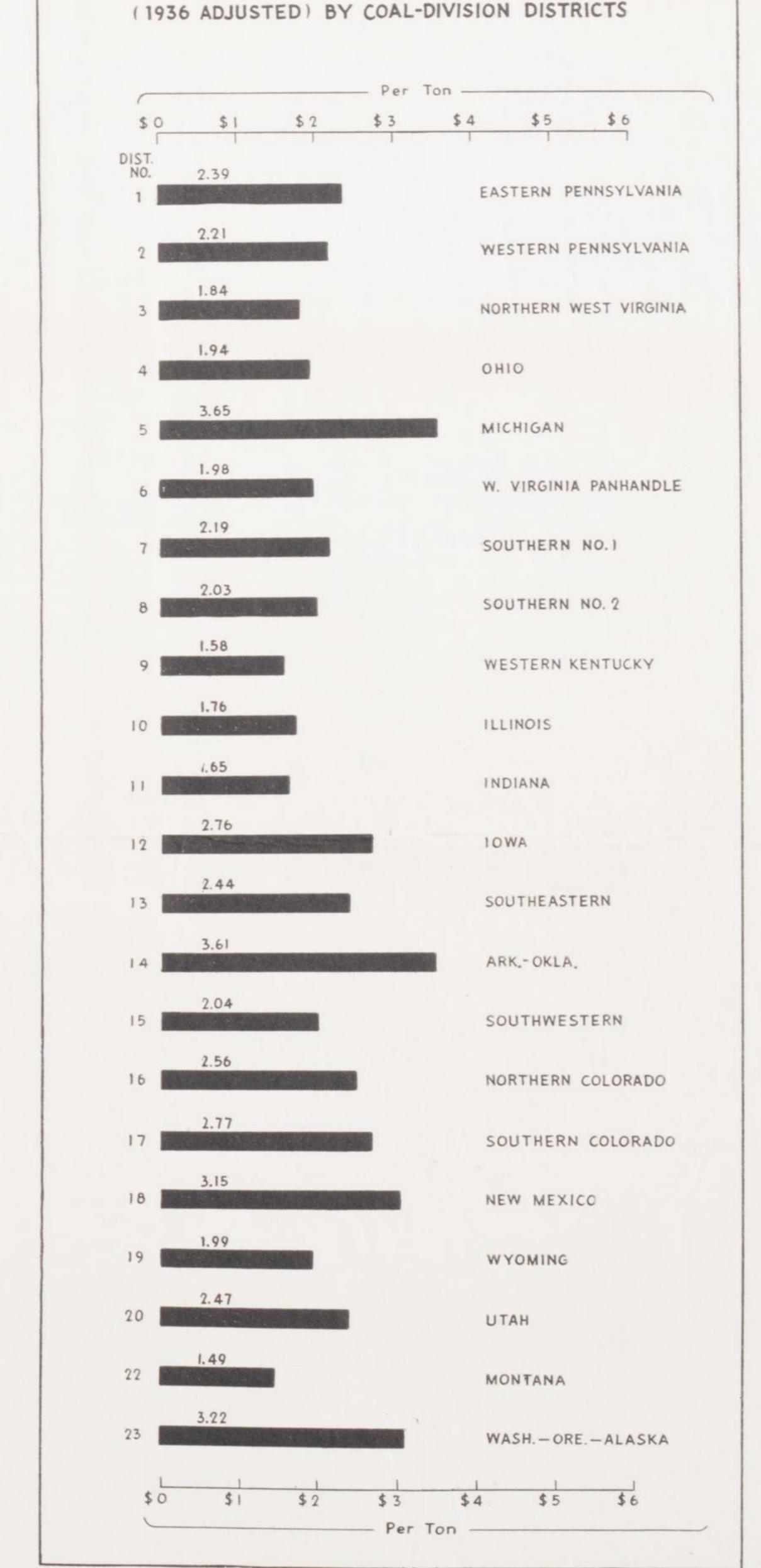








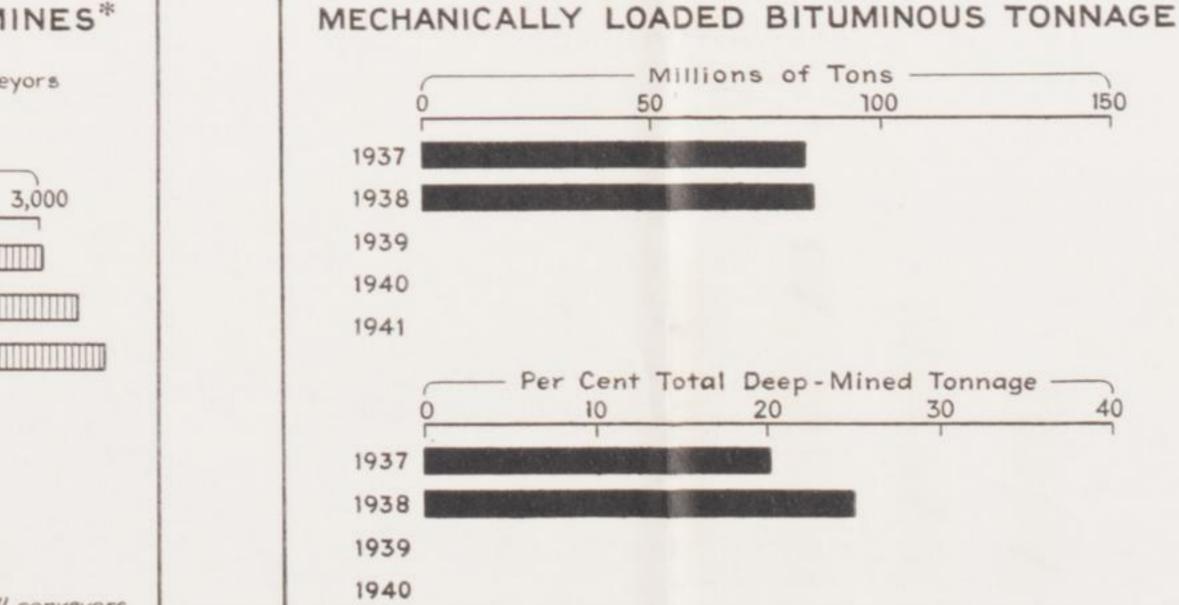
WEIGHTED AVERAGE BITUMINOUS PRODUCTION COSTS

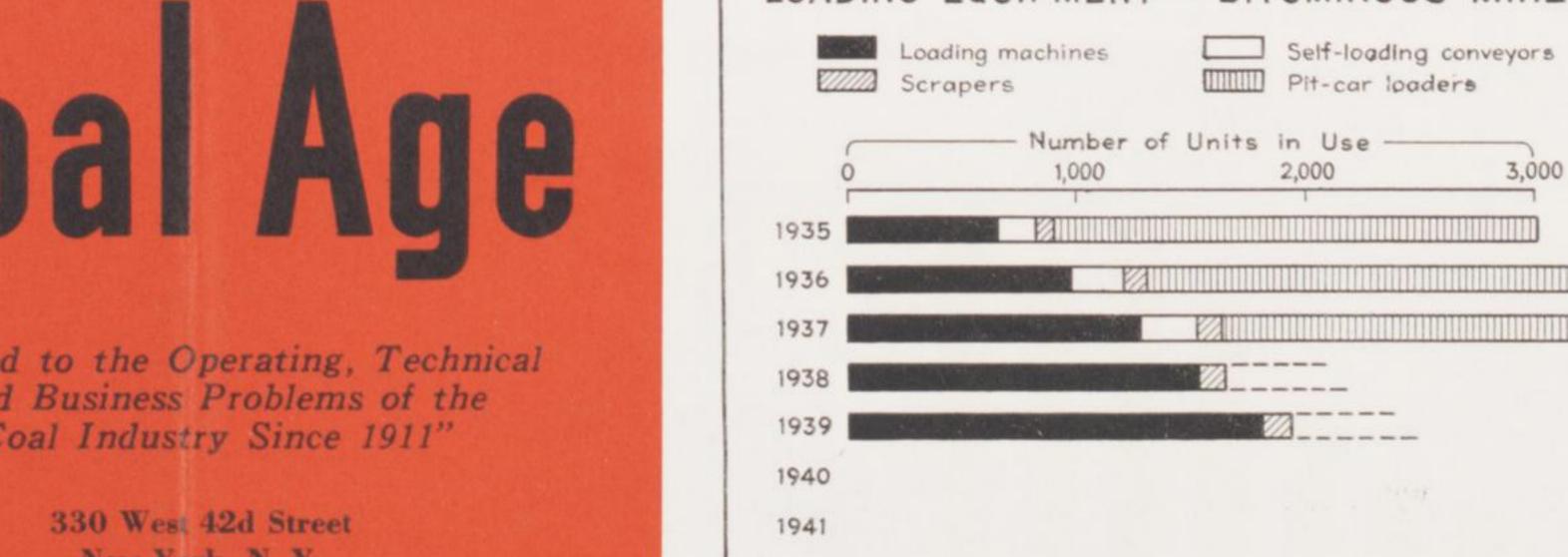


### 117. Has a survey been made of the

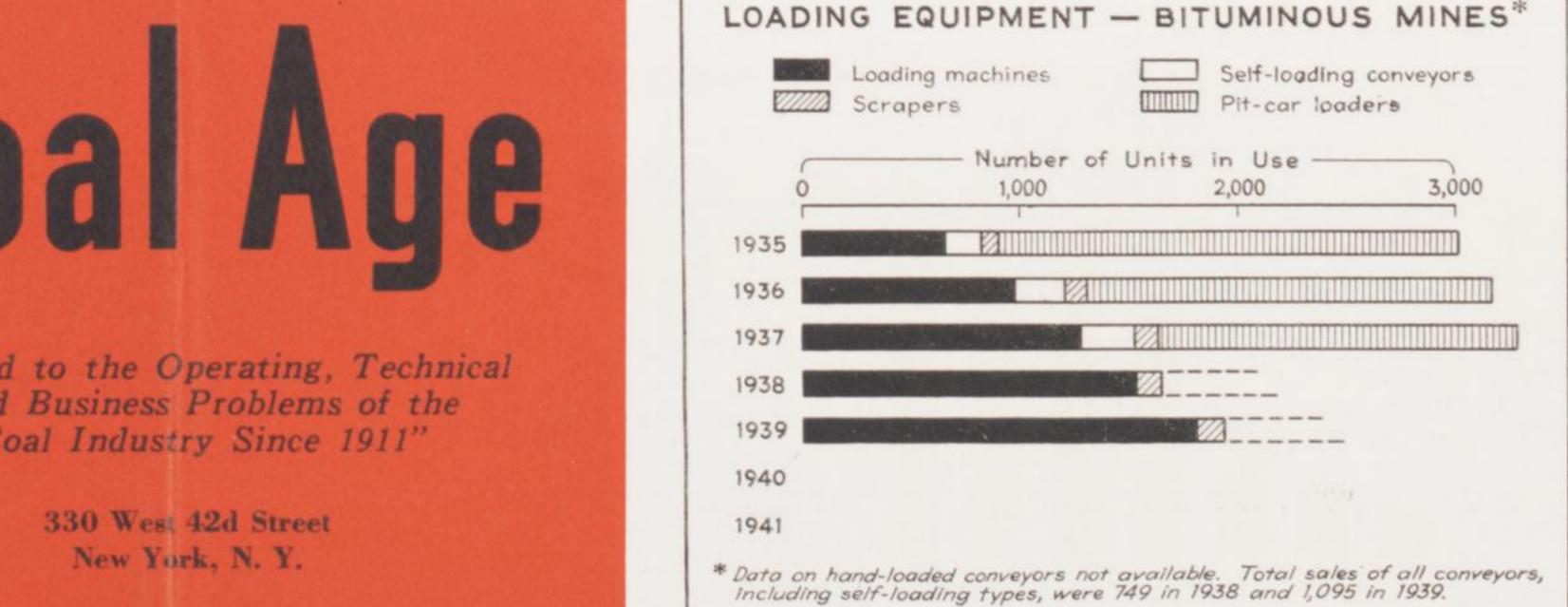
116. Has refuse been investigated for

- Millions of Tons -Per Cent Total Deep-Mined Tonnage









# Supplement to the April, 1940, issue of Coal Age