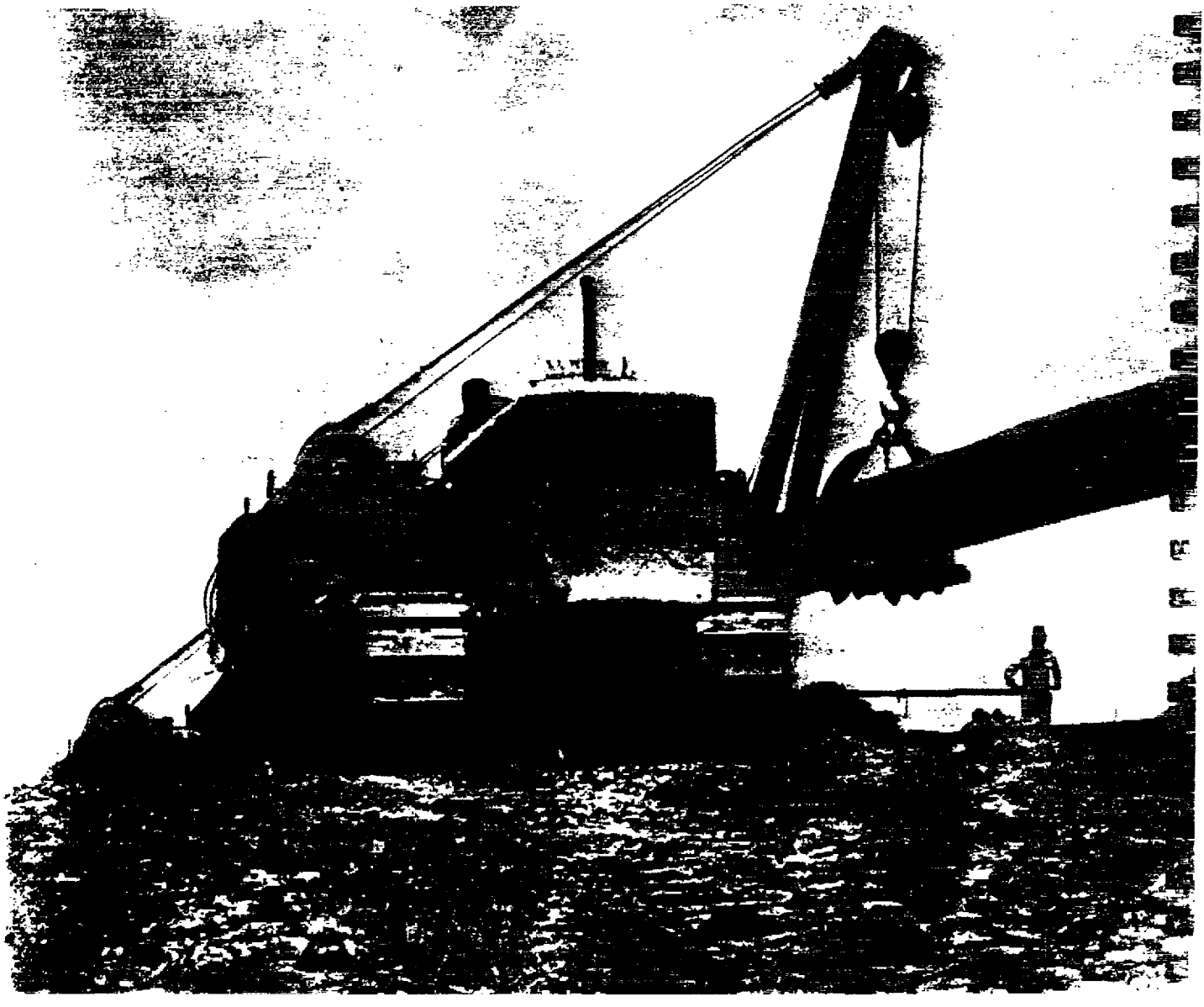
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THE BITUMASTIC

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PIPE LINE HANDBOOK

. . . FOR THE ASSISTANCE OF PIPE LINE ENGINEERS AND CONTRACTORS

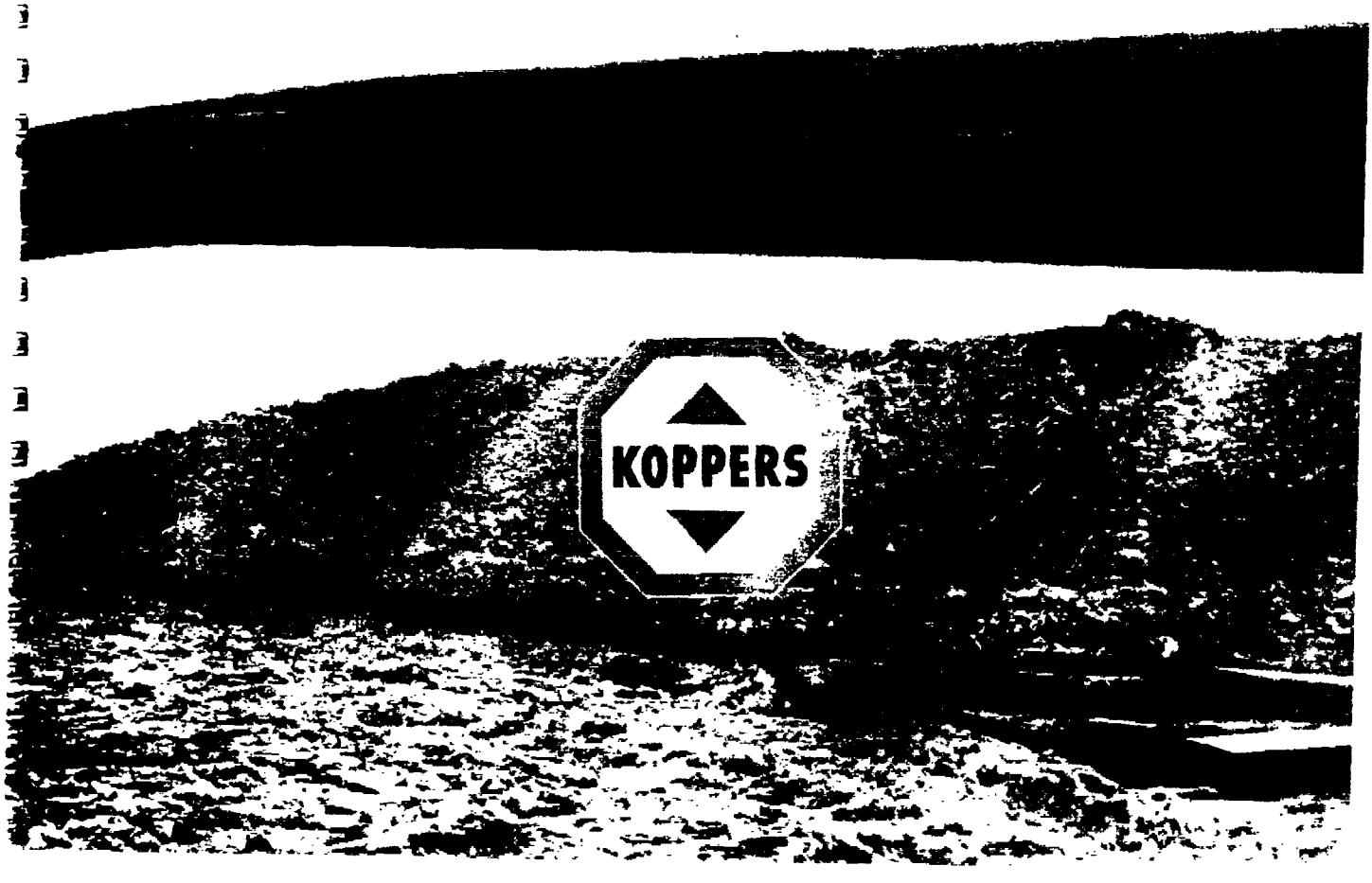
in securing the most effective selection and application of protective coatings for gas and oil (crude and products) pipe lines.

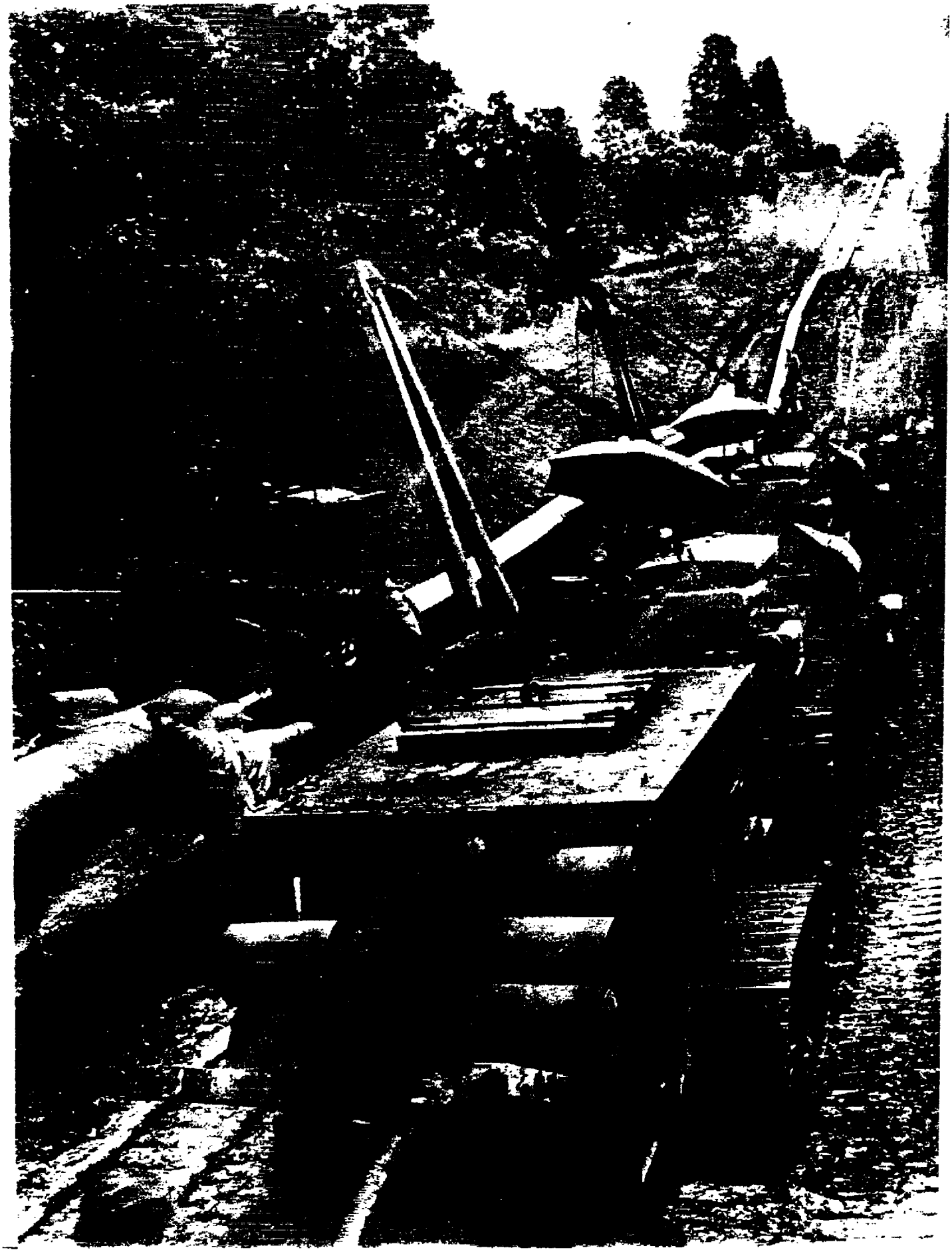
. . . FOR THE GENERAL INFORMATION OF

anyone who may be interested directly or indirectly in the construction and protection of pipe lines.

BITUMASTIC IS A REGISTERED TRADE-MARK

ONLY KOPPERS MANUFACTURES BITUMASTIC PRIMING SOLUTIONS AND ENAMELS IN THE UNITED STATES AND CANADA

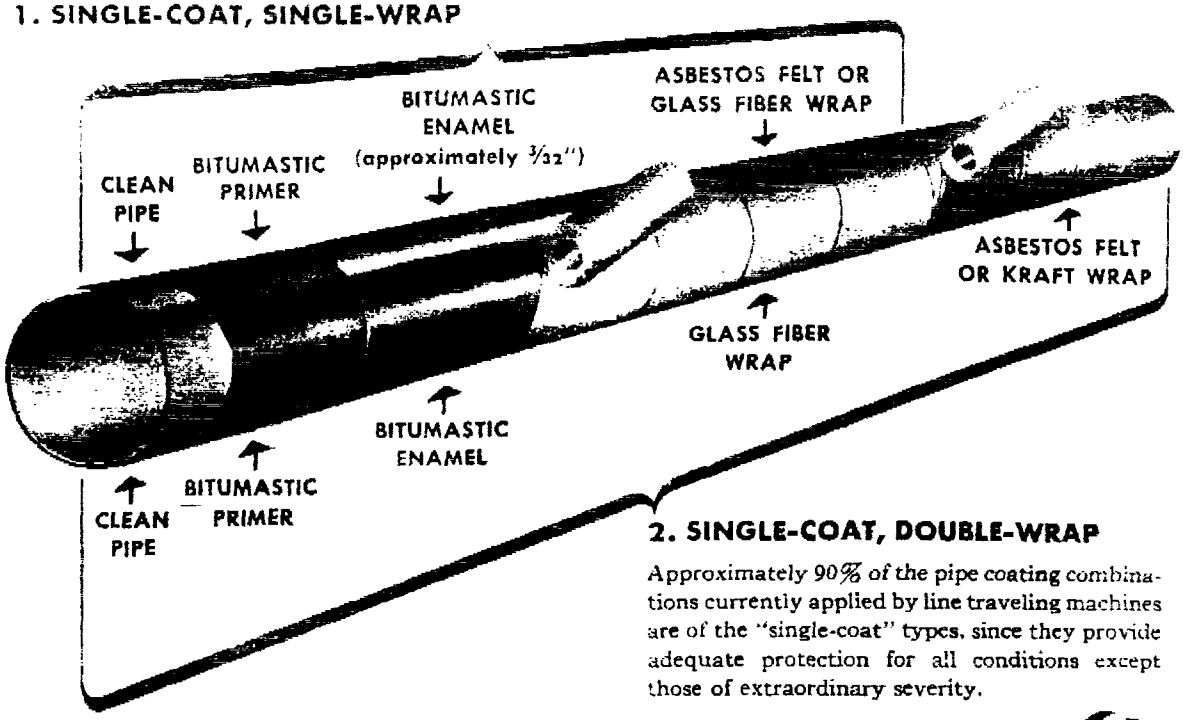




DIFFERENT TYPES OF PIPE LINE PROTECTION IN USE TODAY

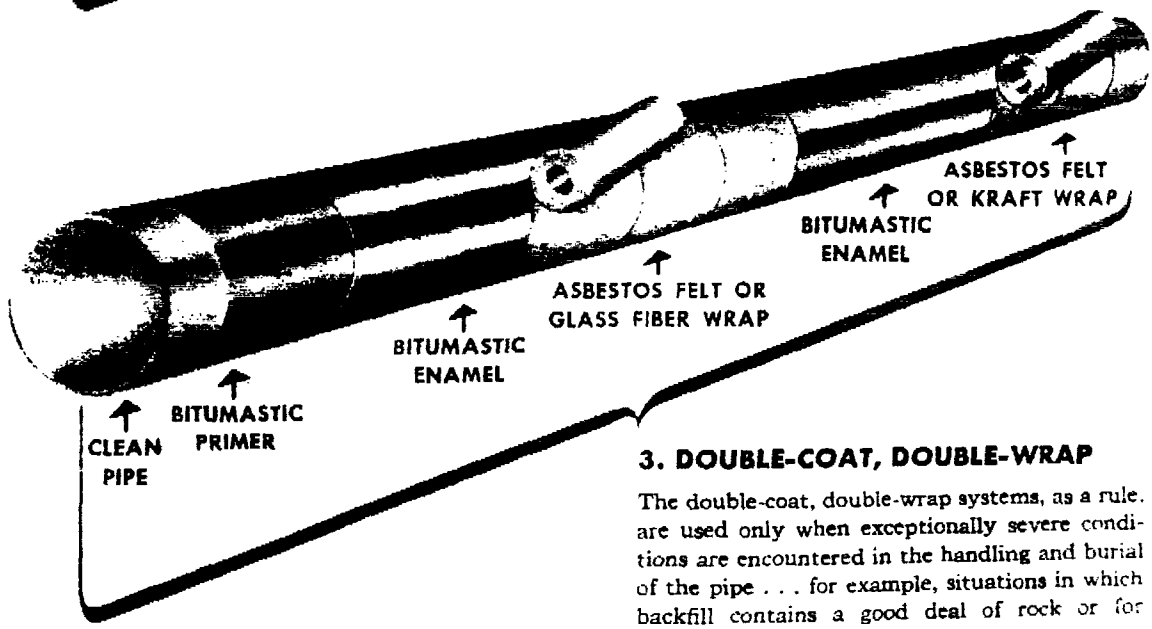
For line traveling machine application in the field, the combinations of pipe coating materials generally used today are as follows:

1. SINGLE-COAT, SINGLE-WRAP



2. SINGLE-COAT, DOUBLE-WRAP

Approximately 90% of the pipe coating combinations currently applied by line traveling machines are of the "single-coat" types, since they provide adequate protection for all conditions except those of extraordinary severity.



3. DOUBLE-COAT, DOUBLE-WRAP

The double-coat, double-wrap systems, as a rule, are used only when exceptionally severe conditions are encountered in the handling and burial of the pipe . . . for example, situations in which backfill contains a good deal of rock or for river crossings.

PRESENT-DAY METHODS FOR PROTECTING PIPE LINES

BY THE LINE TRAVELING MACHINE METHOD

Modern methods of applying protective coatings to pipe for underground service represent a great advance from the techniques used in the early days of pipe line construction.

The early methods were by no means ineffective. In fact, Bitumastic Enamel Coatings, applied to pipe by the "granny-rag," dauber, or sling (without wrappers) more than thirty-five years ago, are still providing effectual protection against corrosion. Relatively crude and incomplete as these early installations were in comparison with modern pipe line protection, they provide evidence of the high and *inherent* protective capacity of Bitumastic Enamels. And Bitumastic Enamels themselves have, of course, been greatly improved over the past quarter century.

As the drawings on the opposite page indicate, the basic elements in modern pipe line protection are . . .

THOROUGH CLEANING OF THE BARE PIPE

Permanent effective pipe line protection demands that the protective coatings be firmly and continuously bonded to the *pipe metal itself*. In other words, the coatings must be applied to pipe surfaces that have been thoroughly cleaned. A positive, continuous and permanent bond cannot be made to foreign matter such as rust, welding scale, dirt, dust or moisture.

THE PRIMER (and what it does)

The function of the primer is to provide *maximum adhesion* between the pipe surface and the protective system as a whole.

Bitumastic Primers are formulated and processed to adhere tenaciously to the steel and, at the same time, to provide a compatible and highly adhesive base for Bitumastic Enamels applied over them.

Bitumastic Primers are also designed for rapid drying and time-saving between priming and enameling.

THE ENAMEL COATING

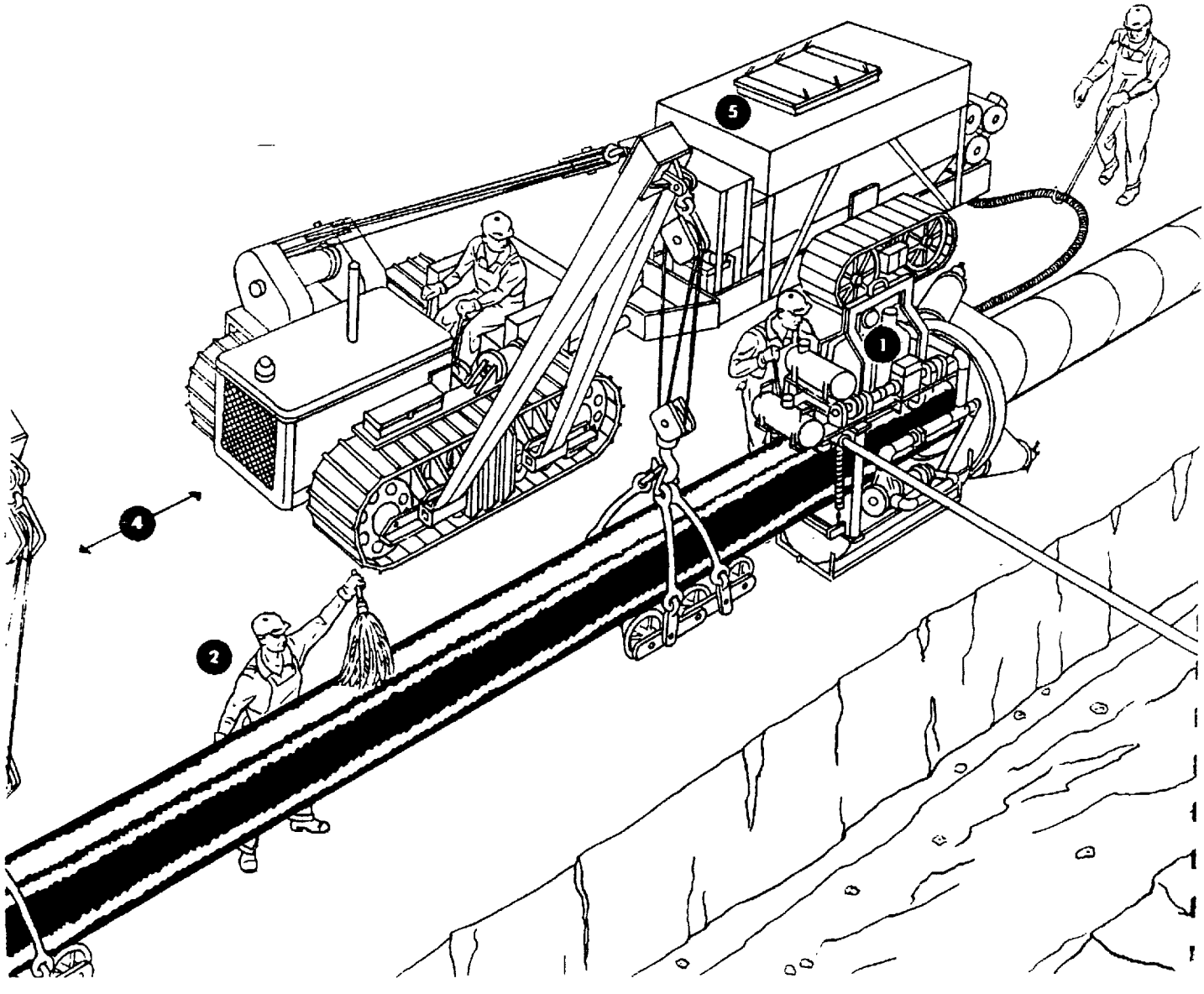
In the pipe protection system, the enamel is the principal element of resistance to the attacks of underground corrosive agents. Bitumastic Enamels, inherently resistant to water, electrochemical action and electrolysis, provide an impervious protective skin or barrier around the pipe, effectively shielding the steel from the metal-destroying action of soil water and soil chemicals. Another important advantage of Bitumastic Enamels is that they can be applied to a thickness of approximately $\frac{3}{32}$" in a single coat.

THE WRAPPING

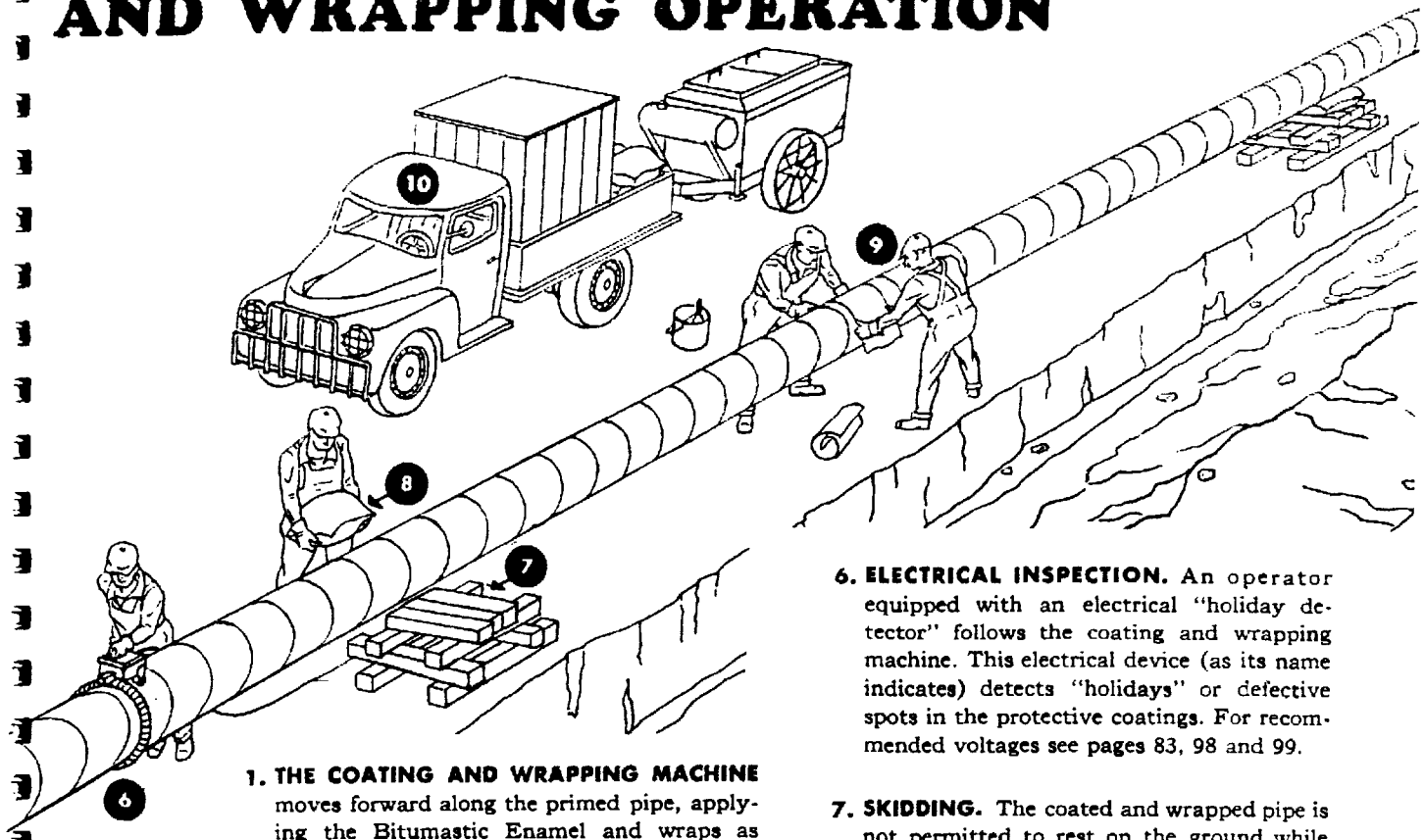
The primary purpose of the wrapping is to protect the Enamel from mechanical damage during and following the installation of the coated pipe underground. In order to function properly as a shield or reinforcement, the wrapper (or wrappers if two are used) must be made of materials highly resistant to deterioration through contact with soil, water and chemicals. Because of their exceptional inertness to water and chemicals, coal-tar-saturated asbestos felt and/or glass wrap are generally used as wrapping materials in present-day protective systems.

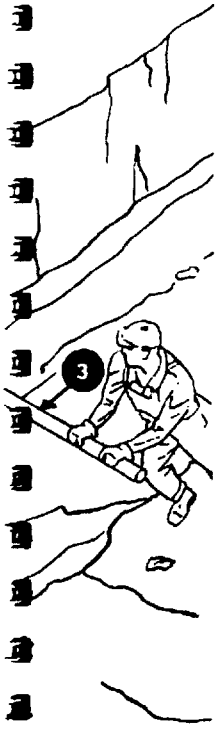
THE LINE TRAVELING COATING

The coating and wrapping operation (illustrated here) follows the cleaning and priming operation after a suitable interval. This interval will usually be within the range of 1 to 120 hours. Insufficiently dried Primer will not provide maximum adhesion with the Enamel coating. On the other hand, over-dried or "dead" Primer will lose its adhesive capacity. When the temperature is warm and the weather is clear, a few hours' drying is satisfactory. For practical tests to determine proper dryness see pages 79, 93 and 94.



AND WRAPPING OPERATION





1. **THE COATING AND WRAPPING MACHINE** moves forward along the primed pipe, applying the Bitumastic Enamel and wraps as it travels.

2. **THOROUGH REMOVAL OF DUST** from the dry Primer is necessary to insure proper adhesion to the Enamel.

3. **THE "HOOSIER POLE"** keeps the machine in vertical balance.

4. **A PAIR OF SIDE-BOOM TRACTORS** is generally used to lift and support the primed pipe for the passage of the coating and wrapping machine. Moving support is provided by roller cradles controlled by block and tackle from the booms. Care is exercised to minimize damage to the Primer.

5. **THE HEATING KETTLE** containing the Enamel heated to proper application temperature and carrying a supply of rolled wraps, is drawn by the rear tractor. Enamel is fed from the kettle to the machine through a special flexible metal hose.

6. **ELECTRICAL INSPECTION.** An operator equipped with an electrical "holiday detector" follows the coating and wrapping machine. This electrical device (as its name indicates) detects "holidays" or defective spots in the protective coatings. For recommended voltages see pages 83, 98 and 99.

7. **SKIDDING.** The coated and wrapped pipe is not permitted to rest on the ground while the Enamel is still hot. It is supported on skids and remains on the skids until the Enamel is cool and the pipe is lowered into the ditch.

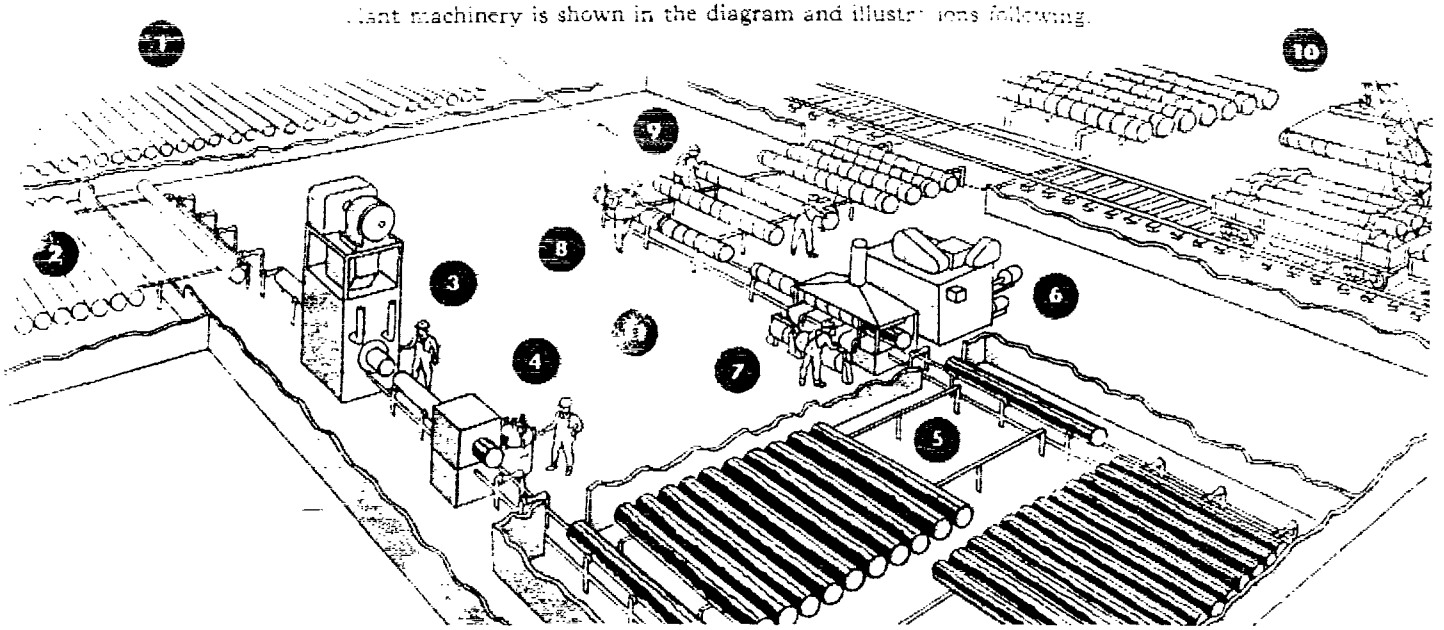
8. **IN HOT WEATHER,** particularly, it is desirable to use sand bags or padded skids to prevent sharp edges of bare skids from cutting into the Enamel and wrap before the Enamel cools.

9. **"TOUCH-UP MEN"** following the coating and wrapping machine make all necessary repairs of missed spots indicated by the "holiday detector" or caused by mechanical damage to the coatings.

10. **A SUPPLY TRUCK** carries all necessary tools and materials for the handling of the repair work . . . as well as other supplies and materials utilized in the coating and wrapping operation.

LAYOUT OF A TYPICAL PIPE COATING

This diagram illustrates the layout and flow of operations in a typical pipe coating and wrapping factory. Although these plants differ somewhat in arrangement and types of equipment, they all have facilities for thoroughly completing each of the steps in pipe protection. Typical coating plant machinery is shown in the diagram and illustrations following.



1. STORAGE FACILITIES

Pipe coating and wrapping factories usually include extensive yard facilities for the outdoor storage of bare pipe in the range of sizes required in the construction of gathering, transmission and distribution lines. They also have storage areas (both indoors and outdoors) for coated and wrapped pipe.

As an extra service to their customers, some factories store bare pipe for several months, pending completion of construction plans.

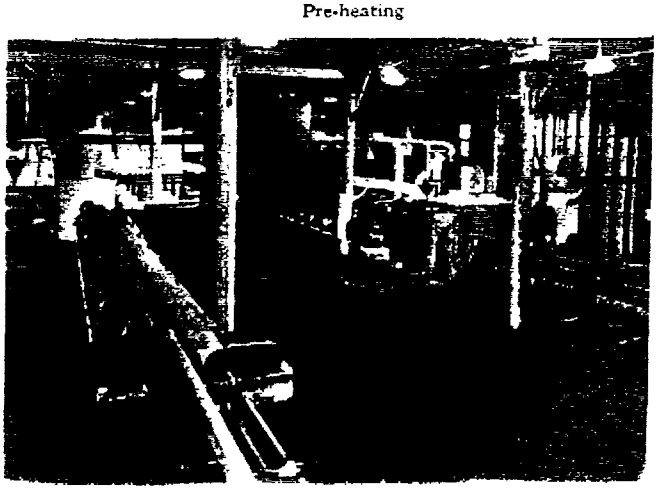
Typical Storage Facilities



2. PRE-HEATING

The bare pipe is transferred from the storage area to a pre-heating area (shown in the center background of picture below). Pre-heating performs two important functions. Incoming pipe, passing through the warming area, loses all surface moisture that might slow up or be detrimental to the cleaning and priming processes. And pre-heating warms the pipe to the most appropriate temperatures for efficient cleaning and priming.

Pre-heating



AND WRAPPING FACTORY (continued on n page)

3. CLEANING

The warm, dry pipe passes from the warming area into the cleaning unit. The cleaning process (as emphasized in connection with the coating of pipe in the field) is vitally important to effective protection. Primers cannot be positively and permanently bonded to bare pipe from which loose rust, scale, dirt, oil, grease or other surface contaminants have not been completely removed.

The cleaning unit may be any one of several basic types of cleaning apparatus. The cleaning operation may be done by rotary blasting with steel grit, rotary blasting with steel shot, air pressure grit, shot or sand-blasting, mechanical cleaning with rotary wire brushes, flame cleaning, manual cleaning with scrapers or solvents, or combinations of these methods.

Generally, blasting is regarded as the most effective cleaning process. The sharp edges of the abrasive provide a cutting action that effectively cleans away all contaminants and leaves a roughened pipe surface. The roughened surface provides an excellent mechanical key for the priming coat that is applied immediately following cleaning.

Because of various job conditions, no statements or illustrations in this Handbook should be regarded as expressing a preference for any specific method of cleaning or type of cleaning equipment.

The pipe line engineer, realizing the vital necessity for thorough cleaning of pipe before coating, will look to his Coating Applicator to provide the most appropriate cleaning method for specific coating jobs.

4. PRIMING

The priming unit in a coating factory consists of apparatus for spraying, or brushing, dry and thoroughly cleaned pipe with Primer.

Mechanical agitators are used to uniformly mix the Bitumastic Primers in the drums in which they are received. The thoroughly mixed Primer is then transferred from the drums to pressure tanks. These tanks are equipped with mechanical agitators to maintain constant uniformity of Primer during application. Bitumastic Primers or Priming Solutions are formulated and furnished in proper consistencies for application by spraying. Consequently, an adjustment of consistency by the addition of thinners is rarely made.

Spray equipment is properly designed and adjusted to apply Bitumastic Primers as received without thinning. Special filters are incorporated in the compressed air system to remove all moisture and oil from the air.

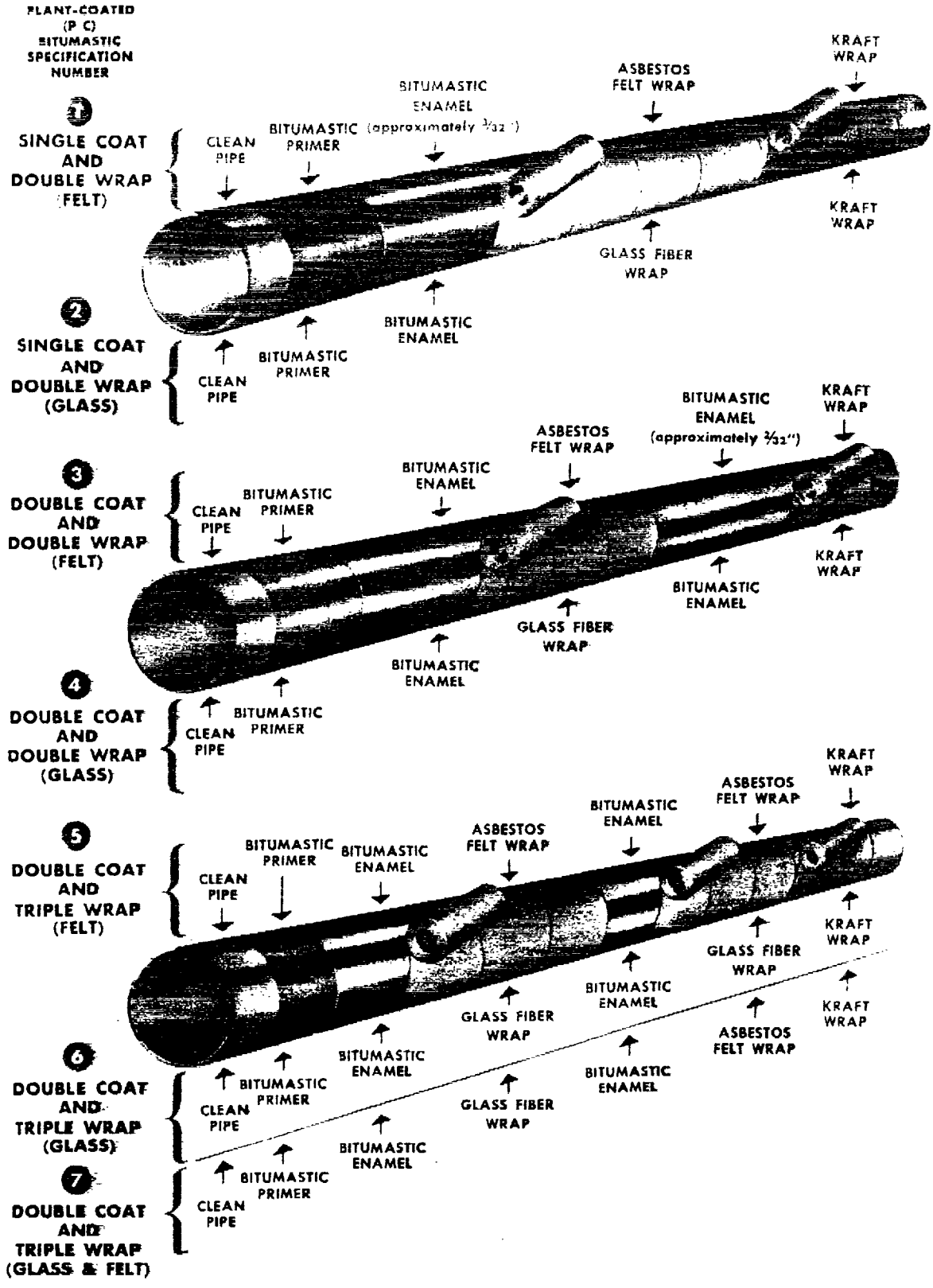
Brush applications are made by mechanically rotated priming heads. Instead of using horsehair or bristle brushes, these heads are equipped with two bands or "rugs" cut from high nap carpet. The "rugs" are adjusted to the correct tension, then saturated with the proper amount of Bitumastic Primer. The revolving "rugs" brush on the Primer very evenly. A steady, adjusted stream of Primer is applied to the top of the pipe a few inches ahead of the rotary priming heads.

Any accumulations of excess Primer at the base of welds is brushed out by hand after the pipe has passed through the priming machine. Thin or missed spots are also covered by hand-brushing with bristle brushes.

Cleaning Machine

Priming Equipment




PLANT-COATED (P C) BITUMASTIC SPECIFICATION NUMBER
1
SINGLE COAT AND DOUBLE WRAP (FELT)
CLEAN PIPE
BITUMASTIC PRIMER
BITUMASTIC ENAMEL (approximately 3/32")
ASBESTOS FELT WRAP
KRAFT WRAP
GLASS FIBER WRAP
2
SINGLE COAT AND DOUBLE WRAP (GLASS)
3
DOUBLE COAT AND DOUBLE WRAP (FELT)
4
DOUBLE COAT AND DOUBLE WRAP (GLASS)
5
DOUBLE COAT AND TRIPLE WRAP (FELT)
6
DOUBLE COAT AND TRIPLE WRAP (GLASS)
7
DOUBLE COAT AND TRIPLE WRAP (GLASS & FELT)

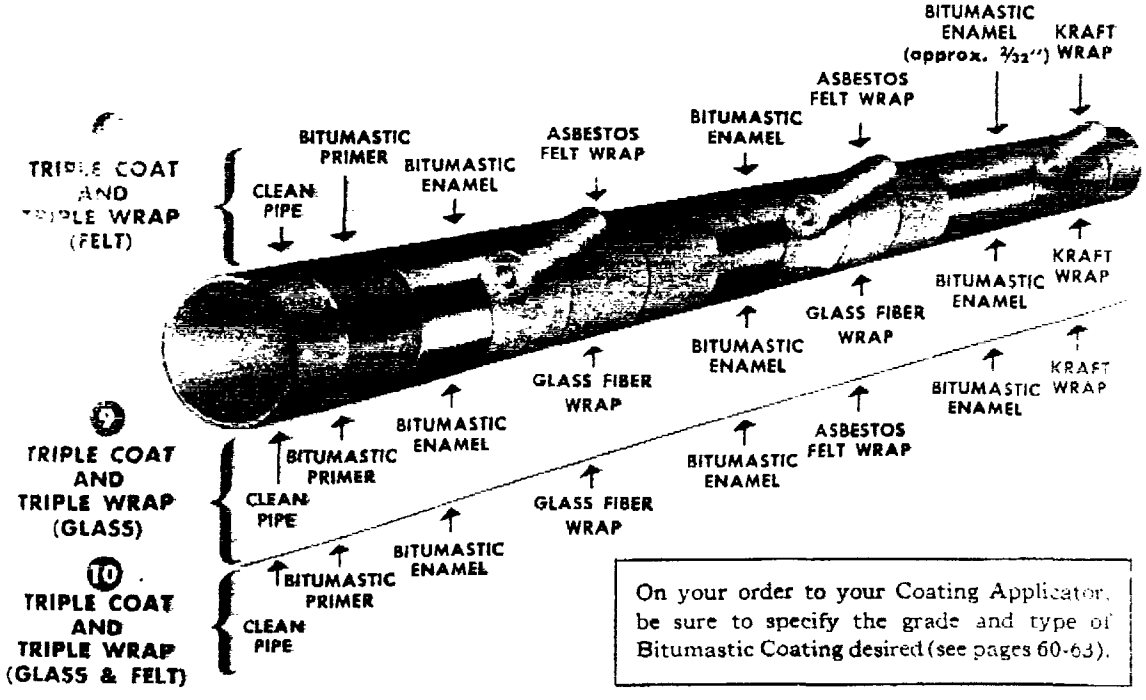
BITUMASTIC®

PLANT-COATED PIPE SPECIFICATIONS

All coating plants have the facilities for applying all of the types and grades of Bitumastic Primers and Bitumastic Enamels described in detail in Part 2, Section H.

The procedure to be followed for specifying and ordering Bitumastic Coatings to be applied at the coating plant is:

1. On the order for pipe from the pipe mill or pipe supply house indicate that the bare pipe is to be shipped to the address of the Coating Applicator. Specify that the pipe shall be free of excessive rust, grease, oil, mill lacquer, or any type of paint.
2. Another order should be sent to the Coating Applicator, specifying the grade of Bitumastic Primer and Enamel to be used; also the desired Bitumastic specification number as described in the illustrations on the page opposite or below.
3. Your order to the Coating Applicator should also give the footages of each diameter pipe to be coated and wrapped; as well as the type of joint to be used for making up the pipe line in the field. For identification purposes, your order to the Coating Applicator should carry the name and address of the pipe supplier and your order number to him.



On your order to your Coating Applicator, be sure to specify the grade and type of Bitumastic Coating desired (see pages 60-63).

CLEAN UP

DISPOSAL OF SPILLED ENAMEL

Any Enamel which is spilled during application as well as pieces of chopped Enamel which are dropped along the right of way, shall be removed, cleaned and used or buried to prevent their being eaten by livestock which like the taste of the Enamel. Although the Enamel is not poisonous, it is indigestible and an animal eating a large amount at one time may die as a direct result.

DISPOSAL OF MISCELLANEOUS MATERIALS

Enamel drum tins, empty Primer drums, broken skids and other miscellaneous material shall be hauled away from the right-of-way and disposed of. Such objects shall not be thrown into the ditch before or during backfilling.

HEALTH AND SAFETY PRECAUTIONS

BITUMASTIC PRIMERS

When handling or applying Bitumastic Primers, protect exposed skin areas with a suitable cream such as cold cream or one of the unguents identified by such trademarks as Ply No. 2, 6 or 9, Noxzema, and Vaseline. Any Primer which is accidentally splashed in the eye, should be washed out with mineral or olive oil, not water. Go to a doctor as soon as possible.

BITUMASTIC ENAMELS

In hot weather the vapors from heating Bitumastic Enamels may irritate exposed skin areas. Protect the hands by wearing leather gauntlets. Before starting work, apply a suitable skin protective cream to the exposed face and neck areas. Be careful to avoid burns from the hot Enamels. In the event of a bad accidental burn, go to a doctor as quickly as possible. Do not remove the Enamel. When Enamel is accidentally spattered and minor burns result, strip off the Enamel then apply a good burn ointment such as those identified by the trademarks Vaseline, Unguentine, and Gadoment. Protect new skin with bandage and keep clean to avoid infection.



DETAILED INDEX FOR PART 3
(OTHER USES)

SECTION	SUBJECT	CONTENTS		PAGE
Q	**OTHER USES FOR BITUMASTIC ENAMELS AND COATINGS**	In the Oil and Gas Industries		106
R	**GAS INDUSTRY**	Compressor Station Exhaust Systems		107
		Cooling Towers		107
		Underground Storage Tanks		108
		Gas Holders		108
		Distribution Pipe Lines		109
		Service Pipe		109
S	**OIL INDUSTRY**	Tankers and Barges		110
		Crude Oil Storage Tanks		111
		Marine Piers and Platforms	Bearing Piles and Structural Members	112
			Bulkhead Work	113
			Piping	113
		Water Storage		114
		Water Lines		115
		Stacks		116
		Process Equipment		116

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