

TABLE I.*
Permissible Explosives Tested Prior to August 31, 1923

Brand.	Class designation.	When used with detonators, preferably electric detonators of not less efficiency than—	Unit defective charge.	Rate of detonation in 1¼ by 8 inch cartridge.		Manufacturer.
			Grams.	Feet per second.	Meters per second.	
Apache coal powder A.....	Class 1a....	No. 6.....	222	11,710	3,571	Apache Powder Co., Benson, Ariz.
Apache coal powder B.....	do.....	do.....	241	8,210	2,503	Do.
Austin Red Diamond No. 1.....	do.....	do.....	227	10,950	3,339	Austin Powder Co., Cleveland, O.
Austin Red Diamond No. 5.....	do.....	do.....	241	8,720	2,658	Do.
Austin Red Diamond 1-A, L.F.**.....	do.....	do.....	231	12,860	3,921	Do.
Austin Red Diamond 2-A, L.F.†.....	do.....	do.....	252	10,760	3,281	Do.
Austin Red Diamond 4-A, L.F.‡.....	do.....	do.....	252	10,760	3,281	Do.
Austin Red Diamond 5-A, L.F.§.....	do.....	do.....	249	6,400	1,951	Do.
Austin Red Diamond 6-A, L.F.¶.....	do.....	do.....	220	13,630	4,154	Do.
Austin Red Diamond 1-D, L.F.¶.....	do.....	do.....	225	12,440	3,792	Do.
Big Red No. 1.....	Class 1a....	do.....	240	7,250	2,209	The Equitable Powder Manufacturing Co. and the Egyptian Powder Co., East Alton, Ill.
Big Red No. 7.....	do.....	do.....	227	10,000	3,050	Do.
Bituminite No. 1.....	Class 4....	do.....	318	12,800	3,901	Hercules Powder Co., Wilmington, Del.
Bituminite No. 4.....	do.....	do.....	301	7,540	2,298	Do.
Bituminite No. 5.....	Class 1a....	do.....	231	9,120	2,782	Do.
Bituminite 5, L.F.....	do.....	do.....	232	10,390	3,169	Do.
Black Diamond No. 2-A.....	Class 4....	do.....	281	12,600	3,842	Illinois Powder Manufacturing Co., St. Louis, Mo.
Black Diamond No. 3-A.....	do.....	do.....	294	11,160	3,402	Do.
Black Diamond No. 5.....	Class 1a....	do.....	288	6,020	1,835	Do.
Black Diamond No. 6-L. F.....	Class 4....	do.....	306	9,630	2,935	Do.
Black Diamond No. 7.....	Class 1a....	do.....	214	10,730	3,270	Do.
Black Diamond No. 17.....	do.....	do.....	222	10,780	3,287	Illinois Powder Manufacturing Co., St. Louis, Mo.
Cameron mine powder No. 1-A.....	do.....	do.....	227	10,950	3,339	Grasselli Powder Co., Cleveland, O.
Carbonite No. 1.....	Class 4....	do.....	280	10,950	3,338	E. I. du Pont de Nemours & Co., Wilmington, Del.
Carbonite No. 2.....	do.....	do.....	302	11,380	3,470	Do.
Carbonite No. 3.....	do.....	do.....	325	8,710	2,656	Do.
Carbonite No. 5.....	do.....	do.....	304	10,140	3,092	Do.
Carbonite No. 6.....	do.....	do.....	345	7,490	2,285	Do.
Carbonite No. 7.....	do.....	do.....	334	7,450	2,270	Do.
Coalite A, L. F.....	Class 1a....	do.....	204	11,590	3,534	Atlas Powder Co., Wilmington, Del., and Giant Powder Co. (Con.), Giant, Cal.
Coalite B, L. F.....	do.....	do.....	205	11,390	3,474	Do.
Coalite C, L. F.....	do.....	do.....	215	12,190	3,716	Do.
Coalite D, L. F.....	do.....	do.....	214	12,070	3,680	Do.
Coalite E, L. F.....	do.....	do.....	237	6,220	1,896	Do.
Coalite F, L. F.....	do.....	do.....	362	4,640	1,414	Do.
Coalite G, L. F.....	do.....	do.....	218	7,970	2,430	Do.
Coalite H, L. F.....	do.....	do.....	260	6,350	1,936	Do.
Coalite I, L. F.....	do.....	do.....	267	9,240	2,816	Do.
Coalite KN.....	Class 5....	do.....	220	12,120	3,696	Do.
Coalite LN.....	Class 5....	do.....	226	11,170	3,407	Do.
Coalite Y.....	Class 1a....	do.....	235	10,300	3,141	Do.
Coalite No. 1.....	Class 4....	do.....	296	7,930	2,418	Do.
Coalite No. 2-D.....	do.....	do.....	310	8,430	2,571	Do.
Coalite No. 2-M. L. F.....	do.....	do.....	301	9,220	2,811	Do.
Coalite No. 4-L. F.....	do.....	do.....	307	7,810	2,382	Do.
Coal special No. 2-W.....	do.....	do.....	277	11,590	3,534	Hercules Powder Co., Wilmington, Del.
Coal special No. 3-C.....	do.....	do.....	288	9,760	2,977	Do.
Collier A.....	Class 1a....	do.....	215	11,280	3,440	Do.
Collier B.....	do.....	do.....	207	10,970	3,345	Do.
Collier KN.....	do.....	do.....	222	11,610	3,539	Do.
Collier X, I. F. 1.....	do.....	do.....	237	8,140	2,483	Do.
Collier X, I. F. 2.....	do.....	do.....	228	9,950	3,035	Do.
Collier Y.....	do.....	do.....	229	9,740	2,970	Do.
Collier No. 5.....	do.....	do.....	240	8,280	2,524	Do.
Collier No. 5, special.....	Class 1a....	No. 6.....	236	8,330	2,541	Do.
Collier No. 11.....	do.....	do.....	217	11,680	3,561	Do.
Cronite No. 1.....	Class 1a....	No. 6.....	233	10,490	3,198	G. R. McAbee Powder & Oil Co., Pittsburgh, Pa.
Duobel.....	do.....	do.....	213	10,960	3,341	E. I. du Pont de Nemours & Co., Wilmington, Del.
Duobel L. F.....	do.....	do.....	225	12,440	3,792	Do.

*Prepared by U. S. Bureau of Mines.
**Same as Monobel No. 1, L. F.

†Same as Monobel No. 2, L. F.
‡Same as Monobel No. 4, L. F.
§Same as Monobel No. 5, L. F.

¶Same as Monobel No. 6, L. F.
‡Same as Duobel, L. F.

Permissible Explosives Tested Prior to August 31, 1923

Brand.	Class designation.	When used with detonators, preferably electric detonators of not less efficiency than—	Unit defective charge.	Rate of detonation in 1 1/4 by 8 inch cartridge.		Manufacturer.
				Grams.	Feet per second.	
Duobel No. 2.....	Class 1a.....	No. 6.....	217	11,160	3,401	E. I. du Pont de Nemours & Co., Wilmington, Del.
General A.....	Class 4.....	do.....	274	13,500	4,116	General Explosives Co., Chicago, Ill.
General B.....	do.....	do.....	299	10,640	3,244	Do.
General C.....	do.....	do.....	304	10,460	3,190	Do.
General 1.....	Class 1a.....	do.....	208	10,650	3,247	Do.
General 2.....	do.....	do.....	217	11,510	3,508	Do.
General 3.....	do.....	do.....	213	8,150	2,486	Do.
General 3-X.....	do.....	do.....	230	8,950	2,730	Do.
General 4.....	do.....	do.....	227	10,920	3,330	Do.
General 4-X.....	do.....	do.....	224	10,760	3,280	Do.
General 5.....	do.....	do.....	220	10,510	3,204	Do.
General 5-X.....	do.....	do.....	274	6,600	2,013	Do.
General 6.....	do.....	do.....	221	12,050	3,674	Do.
General 6-X.....	do.....	do.....	220	10,510	3,204	Do.
Grasselli No. 1.....	do.....	do.....	227	10,950	3,339	Grasselli Powder Co., Cleveland, O.
Grasselli No. 5.....	do.....	do.....	241	8,720	2,658	Do.
Grasselli No. 6.....	do.....	do.....	224	8,090	2,467	Do.
Grasselli No. 2 L. F.....	do.....	do.....	221	10,870	3,313	Do.
Grasselli No. 5 L. F.....	do.....	do.....	223	7,680	2,342	Do.
Grasselli No. 6 L. F.....	do.....	do.....	218	9,210	2,807	Do.
Hercules coal powder A.....	Class 4.....	do.....	277	12,620	3,848	Hercules Powder Co., Wilmington, Del.
Hercules coal powder AA.....	Class 1a.....	do.....	241	7,880	2,403	Do.
Hercules coal powder B.....	Class 4.....	do.....	301	9,870	3,008	Do.
Hercules coal powder C.....	do.....	do.....	344	7,010	2,138	Do.
Hercules coal powder No. 2.....	Class 1a.....	do.....	212	9,280	2,830	Do.
Lomite No. 1.....	Class 2.....	do.....	300	13,940	4,250	G. R. McAbee Powder & Oil Co., Pittsburgh, Pa.
McAbee X.....	Class 1a.....	do.....	217	10,500	3,200	Do.
McAbee Y.....	do.....	do.....	228	10,850	3,307	Do.
McAbee Z.....	do.....	do.....	212	10,610	3,234	Do.
Mine-ite No. 5-D.....	do.....	do.....	241	8,720	2,658	Grasselli Powder Co., Cleveland, O.
Mine-ite No. 6-D.....	do.....	do.....	224	8,090	2,467	Do.
Miners Friend No.1.....	do.....	do.....	223	11,580	3,529	Atlas Powder Co., Wilmington Del.
Miners Friend No. 2.....	do.....	do.....	242	10,330	3,149	Do.
Miners Friend No. 3.....	do.....	do.....	242	8,030	2,449	Do.
Miners Friend No. 4 L. F.....	do.....	do.....	249	9,980	3,044	Do.
Miners Friend No. 5 L. F.....	do.....	do.....	250	8,570	2,614	Do.
Miners Friend No. 6 L. F.....	do.....	do.....	224	10,900	3,324	Do.
Miners Friend No. 7.....	do.....	do.....	253	8,950	2,729	Do.
Monobel Y.....	do.....	do.....	232	9,300	2,835	E. I. du Pont de Nemours & Co., Wilmington, Del.
Monobel No. 1.....	do.....	do.....	216	11,700	3,568	Do.
Monobel No. 2.....	do.....	do.....	239	9,870	3,009	Do.
Monobel No. 3.....	do.....	do.....	243	7,260	2,212	Do.
Monobel No. 4.....	do.....	do.....	248	8,980	2,738	Do.
Monobel No. 5.....	do.....	do.....	267	6,760	2,061	Do.
Monobel No. 6.....	do.....	do.....	218	10,380	3,165	Do.
Monobel No. 8.....	do.....	do.....	216	7,620	2,322	Do.
Monobel No. 9.....	do.....	do.....	222	7,310	2,229	Do.
Monobel No. 1 L. F.....	do.....	do.....	231	12,860	3,921	Do.
Monobel No. 2 L. F.*.....	do.....	do.....	252	10,760	3,281	Do.
Monobel No. 4 L. F.....	do.....	do.....	252	10,760	3,281	Do.
Monobel No. 5 L. F.....	do.....	do.....	249	6,400	1,951	Do.
Monobel No. 6 L. F.....	do.....	do.....	220	13,630	4,154	Do.
Monobel No. 8, L.F.....	do.....	do.....	217	8,240	2,512	Do.
Monobel No. 9, L.F.....	do.....	do.....	223	6,340	1,933	Do.
Pennsylvania coal powder B, L.F.....	do.....	do.....	223	11,100	3,384	Pennsylvania Powder Co., Emporium Pa.
Pennsylvania coal powder C, L.F.....	do.....	do.....	233	10,220	3,117	Do.
Red H No. 1.....	do.....	do.....	216	11,700	3,568	Hercules Powder Co., Wilmington, Del.
Red H No. 2.....	do.....	do.....	239	9,870	3,009	Do.
Red H No. 3.....	do.....	do.....	243	7,260	2,212	Do.
Red H No. 4.....	do.....	do.....	248	8,980	2,738	Do.
Red H No. 4-A, L. F.....	do.....	do.....	227	9,340	2,848	Do.
Red H No. 5.....	do.....	do.....	267	6,760	2,061	Do.
Red H No. 6.....	do.....	do.....	218	10,380	3,165	Do.
Red H No. 7.....	do.....	do.....	211	10,050	3,065	Do.
Red H No. 11.....	do.....	do.....	210	11,090	3,381	Hercules Powder Co., Wilmington, Del.
Red H No. 14.....	do.....	do.....	236	10,470	3,192	Do.
Trojan coal powder J.....	Class 3.....	do.....	360	10,590	3,230	Pennsylvania Trojan Powder Co., Allentown, Pa.

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				Feet per second.	Meters per second.	
Trojan coal powder M-1.....	Class 3.....	No. 6.....	Grams. 232	10,590	3,228	Pennsylvania Trojan Powder Co., Allentown, Pa.
Trojan coal powder M-2.....	do.....	do.....	232	10,650	3,248	Do.
Trojan coal powder M-3.....	do.....	do.....	229	12,010	3,663	Do.
Trojan coal powder M-4.....	do.....	do.....	212	12,280	3,745	Do.
Trojan coal powder M-5.....	do.....	do.....	230	12,810	3,905	Do.
Trojan coal powder M-6.....	do.....	do.....	242	11,810	3,601	Do.
Trojan coal powder P-1.....	do.....	do.....	224	9,370	2,857	Do.
Trojan granular coal powder No. 1.....	do.....	do.....	265	†7,920	†2,416	Do.
Tunnelite AA.....	Class 1a.....	do.....	253	7,690	2,346	G. R. McAbee Powder & Co., Pittsburgh, Pa.
Tunnelite B.....	do.....	do.....	249	9,990	3,047	Do.
Tunnelite C.....	do.....	do.....	255	10,060	3,068	Do.
Tunnelite No. 6.....	Class 4.....	do.....	305	9,670	2,947	Do.
Union A, L. F.....	Class 1a.....	do.....	214	11,670	3,557	Union Explosives Co., Clarksburg, W. Va.
Union B, L. F.....	do.....	do.....	248	10,260	3,128	Do.
Union C, L. F.....	do.....	do.....	254	10,330	3,149	Do.
Union No. 1.....	Class 4.....	do.....	279	11,640	3,548	Do.
Union D. L. F.*.....	Class 1a.....	do.....	223	11,100	3,384	Do.
Union E. L. F.†.....	do.....	do.....	233	10,220	3,117	Do.
Union E, L.F.....	do.....	do.....	207	8,480	2,584	Do.
Vigorite No. 1.....	Class 4.....	do.....	259	10,950	3,338	Atlas Powder Co., Wilmington, Del., and Giant Powder Co. (Con.), Giant, C.
Vigorite No. 5, L. F.....	do.....	do.....	304	10,830	3,303	Do.
Vigorite No. 6, L.F.....	do.....	do.....	345	7,490	2,285	Do.
Vulcan Coal Powder No. 1.....	do.....	do.....	335	7,810	2,381	Puget Sound & Alaska Powder Co., Everett, Wash.
Vulcan Coal Powder No. 2.....	do.....	do.....	283	10,660	3,251	Do.
Xpdite No. 1.....	do.....	do.....	259	10,950	3,338	Hercules Powder Co., Wilmington, Del.
Xpdite No. 2.....	do.....	do.....	302	11,380	3,470	Do.
Xpdite No. 3.....	do.....	do.....	325	8,710	2,656	Do.
Xpdite No. 6.....	do.....	do.....	345	7,490	2,285	Do.

*Same as Pennsylvania Coal Powder B. L. F. †1¼-inch diameter cartridge. ‡Same as Pennsylvania Coal Powder C. L. F.

AUSTIN POWDER COMPANY

CLEVELAND, OHIO

601 Wade Building

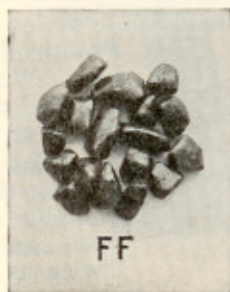
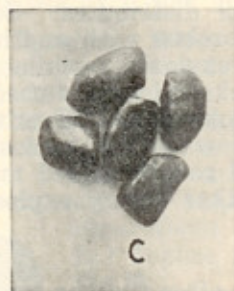
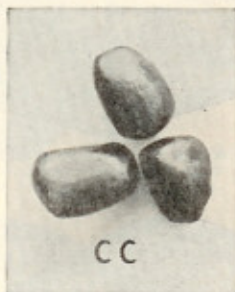


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1833.



Mills at
FALLS JUNCTION, O.
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Blasting Powder, Dynamite, Blasting Supplies AUSTIN RED DIAMOND PERMISSIBLES



Austin Blasting Powder has been manufactured of the best materials obtainable, since 1833 and is of uniform quality and size. It is the standard black powder for coal mining, and has been for many years. For other kinds of blasting it has no equal. It is made in seven sizes, and is calculated to meet every need in the blasting line, where Black Powder can be used at all.

When it becomes necessary to use Permissible Powder, we are now marketing Austin Red Diamond Permissibles, and have a grade suitable for

each vein of coal. Stocks are carried in Distributing Magazines at logical shipping points in Pennsylvania, Maryland and West Virginia.

A complete stock of "Gold Medal" Dynamite and Blasting Supplies is carried at Cleveland, and at our distributing magazines.

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Gold Medal Dynamite



ATLAS POWDER CO.

WILMINGTON, DEL.

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ALLENTOWN, P. A.
BIRMINGHAM, ALA.
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CHARLESTON, W. VA.
CHICAGO, ILL.

DES MOINES, IOWA
HOUGHTON, MICH.
JOPLIN, MO.
KANSAS CITY, MO.
KNOXVILLE, TENN.

McALESTER, OKLA.
NEW ORLEANS, LA.
NEW YORK, N. Y.
NORRISTOWN, PA.
PHILADELPHIA, PA.

PITTSBURGH, KANS.
PITTSBURGH, PA.
POTTSVILLE, PA.
ST. LOUIS, MO.
WILKES-BARRE, PA.



Permissible Explosives

The Atlas Powder Company realized for many years that Permissible Explosives could be improved not only in the way of making better grades of powders, but also in the way of covering the field of requirements more fully. Some of the coal in this country can be broken best with a dense explosive that allows a strong charge to be compressed in the back of the bore hole, whereas other coal breaks better with a bulky explosive, in which the strength is well distributed. Some coal cannot be broken with anything but a strong explosive, while for other coal a weak explosive is needed. Some coal is broken most effectively with a very slow acting explosive, while other coal can be mined much better if a quicker acting explosive is used.

Accordingly, after making careful study of American mine conditions, the Atlas Powder Company has worked out new compositions and has put on the market a new series of Permissible Explosives under the name of Coalite, which includes grades that are quick, that are slow, that are strong, that are weak, that are dense and that are bulky.

Coalite is made in ten grades to meet all conditions of coal mining. All grades have been tested and approved by the U. S. Government Bureau of Mines. The results of the tests show that great improvements have been made in the way of fumes, cold resistance, water resistance, sensitiveness and keeping qualities. One of the Coalite grades is the slowest Permissible on the market and meets exactly the requirements of gassy mines where the coal is easily broken and where the blasting powders of coarser granulations have been used in the past. Another grade has the greatest weight strength of any other Permissible Explosive.

Coalites are supplied in white paper cartridges, standard sizes, and are packed in 50-lb. cases.

High Explosives

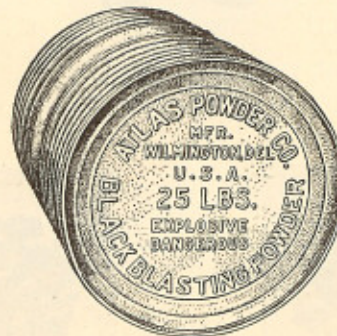
Atlas High Explosives are made in all grades and strengths to meet every requirement of blasting. All Atlas Explosives are low-freezing or non-freezing. Nothing weaker than a No. 6 Blasting Cap should be used to detonate Atlas Explosives.



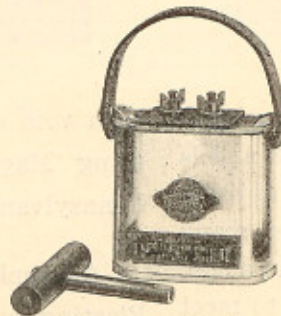
Cartridge—Atlas Dynamite L. F. 40



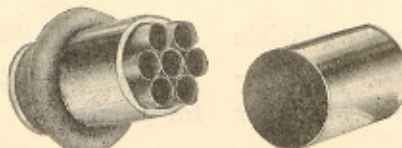
Case—Atlas Coalite—Permissible Explosive



Keg—Atlas Blasting Powder



Atlas No. 1 Blaster



Atlas Moisture-proof Case Cap Carrying Case

Atlas Non-Freezing—A new explosive that will not freeze and will not cause headaches. The ideal explosive for all-year-round work. Made in 6 grades covering all blasting requirements.

Atlas Extra Dynamite—15% to 60%—Spreads and heaves when detonated. Fumes not objectionable. Not waterproof. Recommended for headings, strippings, cuts and other rock or coal blasting that is not wet or gassy.

Atlas Dynamite—25% to 75%—Very quick and shattering. Fumes of 50% and 60% objectionable underground. Partly waterproof. For outside work in hard rock that must be broken small.

Atlas Gelatin—25% to 90%—Practically non-freezing and fumeless. Waterproof. For tunnel driving and rock blasting of all kinds in mines or for under water work.

Atlas R. R. P.—Low Freezing—A granular, low-grade explosive invaluable in cuts, stripping or other open excavating that is not wet. Twice as strong as blasting powder. Put up in 12½-lb. paper bags; packed in 50-lb. cases.

Atlas Blasting Powder—All standard granulations. The smaller the grains, the quicker and more shattering the effect. Hard pressed, dense, regular, moisture-resisting grains. Little smoke. Glazed. Packed in 25-lb. kegs and 5-lb. cans.

BLASTING SUPPLIES

Atlas Blasters—Three Sizes—Particularly suited for coal mine blasting and for all operations where not more than 1, 5 or 10 shots are fired together. Dimensions: Smallest size, 4¾" x 2" x 4½". Weighs (net) 3¼ lbs..

Atlas Moisture Proof Blasting Cap Carrying Case—The first thing

of its kind offered the miner that enables him to take proper care of a day's supply of blasting caps. Made of aluminum, $\frac{7}{8}$ "x $2\frac{1}{8}$ "; holds seven No. 6 or No. 8 blasting caps.

Atlas Blasting Caps—No. 6 and No. 8—Detonated by means of fuse. Packed 25 or 100 to the tin box; 500 or 5,000 to the case.

Atlas Electric Blasting Caps—No. 6 and No. 8 with copper or iron wires. Detonated by an electric blasting machine. Packed 25 and 50 to the carton—10 cartons to the case. Wires 4 ft. to 30 ft. long. Longer lengths on request.

Atlas Blasting Machines (excepting Atlas Blaster described on preceding page) are small portable dynamo mounted in boxes. They are wound somewhat differently from a dynamo built for delivering a continuous current for power or lighting purposes. The armature is rotated by the downward thrust of a rack bar which causes an accumulated electric current to be sent through the blasting circuit. These machines are made in four sizes ranging in weight from 22 lbs. to 75 lbs., and in capacity from 50 to 150 electric blasting caps.

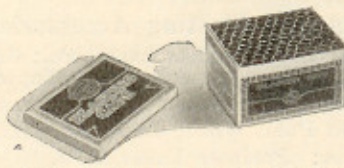
Fuse is used to detonate blasting caps. It may also be used without blasting caps, to explode blasting powder. It comes wrapped in rolls of 100 feet and packed 5 to 60 rolls to the case. There are 9 different brands of fuse to be used under different conditions. Beaver Brand is recommended for damp and dry work; Clover Brand for wet work.

Atlas Galvanometer—An instrument used for testing blasting circuits. With this instrument the resistance of the electric blasting caps connected in a circuit is measured and compared with a table giving the proper resistance in order to determine whether a blasting circuit is "closed" and in proper condition for the blast, or whether it is "open", due to faulty connections, broken wires, leaks or short circuits. The Atlas Galvanometer is contained in a case made of metal and hard rubber, which is in turn enclosed in a

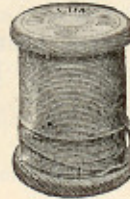
leather carrying case provided with a sling strap. Small and compact. A convenience and necessity to miners, quarrymen and other users of explosives.



Atlas No. 8 Electric Blasting Cap



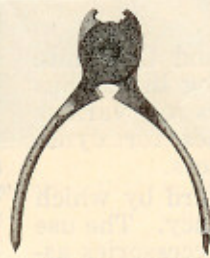
Atlas No. 6 Blasting Cap Box



Spool of Connecting Wire



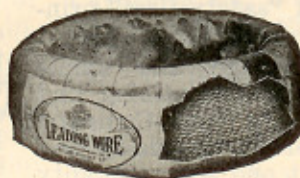
Atlas Blasting Machine No. 3



Atlas Cap Crimper No. 5



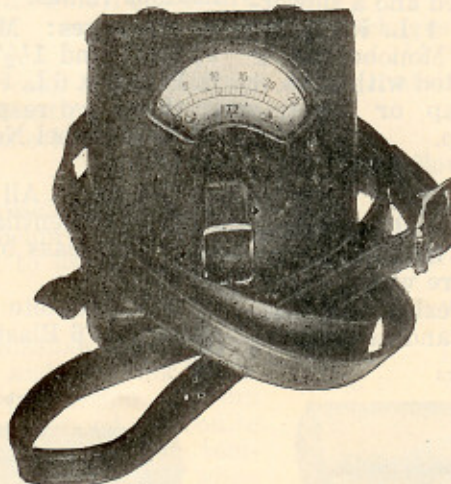
Coil of Fuse



Coil of Leading Wire



Atlas Rheostat



Atlas Galvanometer

Atlas Cap Crimpers—Special tools which provide the only safe, secure and reliable way of attaching blasting caps to fuse. The handle of the crimper is used to punch holes in cartridges for inserting blasting caps. Three types: No. 4, Cut Throat Crimp; No. 5 Broad Jaw Crimp; No. 6 California Broad Jaw Crimp.

Connecting Wire—Small insulated copper wire furnished in two sizes, No. 20 and No. 21. It is used for connecting electric blasting caps to each other when their wires are too short to reach between bore holes. There are 1-lb. and 2-lb. spools. About 230 feet to the lb. for No. 20; about 290 ft. to the lb. for No. 21. Sold by the lb.

Leading Wire—Heavily insulated copper wire furnished in coils of 200, 250, 300 and 500 feet, either single or duplex. It is used to carry the current from the blasting machine to the charge. Single leading wire runs about 50 ft. to the lb.; duplex, about 25 ft. to the lb.

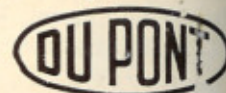
Atlas Rheostat—An instrument used for testing the capacity of blasting machines. When two of its posts are properly connected with one electric blasting cap and blasting machine in a single series circuit, the rheostat offers a resistance which represents the number of electric blasting caps that the blasting machine should fire. This resistance is dependent upon which posts are connected. Figures indicating the number of electric blasting caps to be fired are stamped on the case between the posts. Dimensions of the rheostat are $\frac{3}{4}$ "x $1\frac{3}{4}$ "x $5\frac{1}{2}$ ". Weight: $5\frac{1}{2}$ oz.

Other Atlas Blasting Supplies include Sureshot Shells, Tamping Bags, Thawing Kettles, Delay Electric Blasting Caps, Delay Electric Igniters, Cordeau-Bickford, Blasting Paper, Kapseal, Portable Magazines, Electric Squibs, Miners' Squibs, etc.

Other Atlas Products include Chemicals, Nitro Cellulose Solutions, Leather Cloth, Lacquers, Enamels, Pyroxylin Cements.

E. I. du Pont de Nemours & Company, Inc.

General Offices: WILMINGTON, DEL.



Branch Offices:

BIRMINGHAM, ALA.
BOSTON, MASS.
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PORTLAND, OREGON
SAN FRANCISCO, CAL.
SCRANTON, PA.

SEATTLE, WASH.
SPOKANE, WASH.
SPRINGFIELD, ILL.
ST. LOUIS, MO.

Locations of Explosives Plants and Blasting Accessories Factory:

Blasting Powder: Augusta, Ga.; Connable, Ala.; Du Pont, Wash.; Fairchance, Pa.; Gracedale, Pa.; Jermyn, Pa.; Laurel Run, Pa.; Mooar, Ia.; Moosic, Pa.; Nemours, W. Va.; Storrs Junction, Pa.; Wapwallopen, Pa.; Wilpin, Minn.

Dynamite: Ashburn, Mo.; Barksdale, Wis.; Du Pont, Wash.; Louviers, Colo.; Ramsay, Mont.; Gibbstown, N. J.

Permissible Explosives: Ashburn, Mo.; Du Pont, Wash.; Louviers, Colo.; Gibbstown, N. J.

Blasting Accessories: Pompton Lakes, N. J.

Permissible Explosives, Blasting Powder and Blasting Accessories

Products

Monobel, L. F.; Duobel, L. F., and Carbonite Permissible Explosives for coal mining in gaseous and dusty mines, Blasting Powders of various granulations and Blasting Accessories for dynamite, permissibles and blasting powders.

Du Pont Explosives are the standard by which others are rated for quality and efficiency. The use of du Pont Explosives and Blasting Accessories assures an increased coal production; improved working conditions; reduces the risk incident to mining; and is a practical application of "safety first" principles to coal mining.

Modern plants logically located and ample storage and delivery facilities in the mining and quarrying districts enable the du Pont Company to produce and distribute its products quickly and economically. Specify du Pont and secure quality and highest efficiency.

Monobel L. F. Permissible Explosives

Monobel No. 1 L. F. This explosive is suited especially to trimming and blasting out the "bone" in coal mining. For obtaining a shattering effect, use Monobel No. 1 L. F. It is also adapted to blasting hard coal in narrow seams. Monobel No. 1 L. F. is a low freezing explosive.

Monobel No. 2 L. F. If hard coal, coking coal or hard-shooting soft coal is being mined and a slower-acting explosive than Monobel No. 1 L. F., is required, use Monobel No. 2 L. F. detonated with a No. 6 Blasting Cap or Electric Blasting Cap.



Monobel Case Markings

Monobel No. 2 L. F. is low-freezing and cartridges should not be slit if the bore holes are wet.

Monobel No. 4 L. F. A low-freezing permissible similar to Monobel No. 2 L. F. and adapted to

Monobel Cartridge Markings



hard coal, coking coal and soft coal of the hard-shooting type. As Monobels No. 2 L. F. and 4 L. F. make but little smoke or fumes improvement in working conditions is secured.

Monobel No. 5 L. F. For mining the softest coal and also screened coal, where but little shattering is required, Monobel No. 5 L. F. should be loaded. As the shots produce a very small amount of smoke or fumes, quick return to the face and ability to see effects of blasting upon roof and supports are advantages gained. Monobel No. 5 L. F. is low-freezing.

Monobel No. 6 L. F. This is a low-freezing grade of the Monobel permissibles and has a more shattering effect than Monobel No. 2 L. F. It is practically fumeless. For shooting hard coal and coking coal requiring more breaking than is possible with Monobel No. 4 L. F., load the bore holes with Monobel No. 6 L. F.

Monobel No. 8 L. F. This is a low velocity, low density, high strength permissible with a minimum of fumes. It is especially adapted to producing lump coal. It is low freezing.

Monobel No. 9 L. F. A low-freezing, low-velocity permissible similar to Monobel No. 8 L. F., excepting Monobel No. 9 L. F. has a lower bulk strength because of its low density. There are 175 1 1/4" x 8" cartridges in a 50-lb. case. Monobel No. 9 L. F. produces lump coal with a minimum amount of noxious fumes.

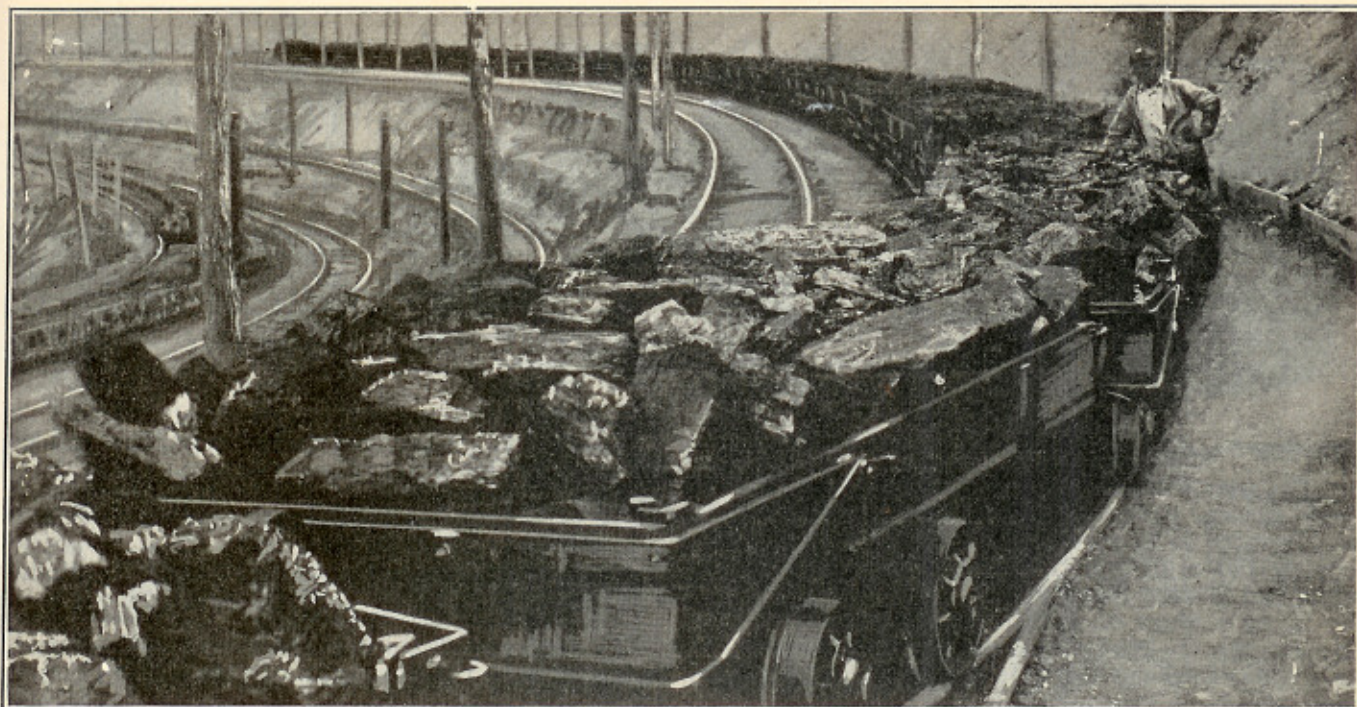
Packages: Monobel permissibles are packed in 1 1/4" x 8" and 1 1/2" x 8" cartridges. Monobels No. 1 L. F. to No. 6 L. F. run about 135 and 100 cartridges in these two respective sizes of the 50-pound case, while Monobel No. 8 L. F. runs about 138 and 102 cartridges.

Storage: All Monobels L. F. must be stored in a dry, well ventilated place, as moisture quickly affects this class of explosives and makes them less effective.

For complete detonation of Monobels L. F. use either No. 6 Blasting Cap or a No. 6 Electric Blasting Cap.

Carbonite Cartridge Markings





Du Pont Permissible Explosives Used to Shoot This Coal

Duobel L. F. Permissible Explosive

This is a low freezing permissible explosive of the Monobel type. Its velocity of detonation is intermediate between Monobel No. 1 L. F. and No. 6 L. F. It is a high velocity, low density explosive, and this combination of qualities makes it particularly adapted for hard-shooting coal where lump is desired. A fifty-pound case of Duobel L. F. contains 155 or more 1 $\frac{1}{4}$ "x8" cartridges. As far as price per stick is concerned, it is one of the cheapest permissible explosives on the market.

Carbonite Permissibles

This class of permissibles is adapted to wet work, and they have a wider range of service than Monobel L. F. permissibles. Carbonite shots produce more smoke and fumes than Monobel L. F. and better ventilation is required where Carbonites are employed.

Carbonite No. 1. For hard coal, hard-shooting soft coal and coking coal and blasting out bottom and top rock, we recommend the loading of Carbonite No. 1.

It is not a low-freezing permissible and is likely to freeze if temperature falls below 45 degrees F. Thaw thoroughly before using to assure satisfactory detonation.

Carbonite No. 2. This permissible differs from Carbonite No. 1 in its strength and breaking qualities. For producing a larger proportion of lump when blasting soft coal, we recommend Carbonite No. 2. Carbonite No. 2 becomes chilled when temperature is below 45 degrees F.—never use it when frozen.

Carbonite No. 3. Very soft coal requiring the least amount of shattering should be shot with Carbonite No. 3 detonated with a No. 6 Blasting Cap or a No. 6 Electric Blasting Cap. This is not a low-freezing permissible—cannot be exploded properly if frozen.

Carbonite No. 6. This is a low-freezing permissible which withstands long exposure to very cold temperatures, and is intended for shooting very soft coal.

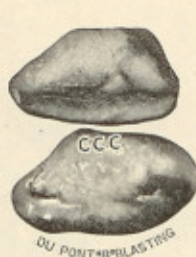
Carbonite No. 7. This is similar to Carbonite No. 6 except that it is of very much lower density.

To ensure the complete detonation of Carbonites, do not use detonators weaker than the No. 6 Blasting Caps or No. 6 Electric Blasting Caps.

Packages: All Carbonites are made in cartridges 1 $\frac{1}{4}$ "x8" and 1 $\frac{1}{2}$ "x8" and packed in wooden cases containing 50 pounds, net.

The following table gives details of packages:

Kind	Dimensions	Approximate Quantity
Carbonite No. 1	1 $\frac{1}{4}$ "x8	105
" " 1	1 $\frac{1}{2}$ "x8	80
" " 2	1 $\frac{1}{4}$ "x8	135
" " 2	1 $\frac{1}{2}$ "x8	103
" " 3	1 $\frac{1}{4}$ "x8	135
" " 3	1 $\frac{1}{2}$ "x8	103
" " 6	1 $\frac{1}{4}$ "x8	135
" " 6	1 $\frac{1}{2}$ "x8	103
" " 7	1 $\frac{1}{4}$ "x8	155
" " 7	1 $\frac{1}{2}$ "x8	110



Illustrations of Keg of Blasting Powder and Granulations Used in Coal Mining

Blasting Powder

The use of blasting powder in coal mines where mine gas and coal dust are not present has become so extensive as to require the production of numerous powder mills and the labor of a large number of skilled powder-makers.

In its century of activity in the explosives' industry, the du Pont Company has adhered rigidly to its standardized methods for selection of materials and their incorporation into blasting powder.

The high quality of materials and their thorough incorporation by means of special machinery results in a powder producing a minimum amount of noxious fumes and smoke.

Today "B" Blasting Powder is recognized as the standard by which other powder is rated.

"B" Blasting Powder is made in seven standard granulations. (See illustration). This variation in sizes enables the selection of the grain to obtain a charge exactly suited to blasting requirements.

To secure a shattering effect, bore holes should be loaded with the finer granulations. The coarse grains are used when only a heaving or lifting action is desired by the miner.

Package: Blasting Powder is packed in 25 pound metal kegs having a moisture-proof cap.

Du Pont Blasting Accessories

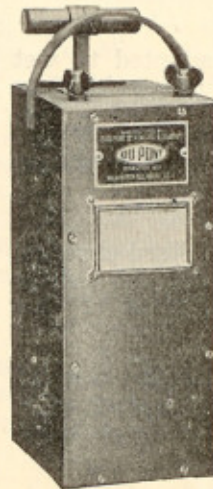
- | | | | | |
|-----------------|------------------------|------------------------------|-------------------|-----------------|
| Connecting Wire | Electric Blasting Caps | Delay Electric Igniters | Rheostats | Electric Squibs |
| Leading Wire | Fuse | Galvanometers | Thawing Kettles | Cap Crimpers |
| Tamping Bags | Blasting Caps | Delay Electric Blasting Caps | Blasting Machines | |

In view of the time and money involved in the preparation for blasting and of the cost of explosives, it is apparent that only the most reliable blasting accessories should be employed. The confidence miners have in du Pont Blasting Accessories is manifested by the steadily increasing demand.

In the designing of our Blasting Machines and testing apparatus, we have sought to obtain simplicity of construction and to ensure a positive and effective performance of the machine or device employed. Our detonators are composed of the very best material and the ingredients are selected because of their fitness to accomplish what is required — imparting the necessary shock to the explosive charges to effect complete detonation.

As the largest manufacturers of explosives and the possessors of extensive experience in the use of explosives in the field, we are especially fitted to devise and introduce detonation apparatus for the explosives adapted to coal mining. To prevent the loss of valuable time and ensure complete detonation of every charge of explosives, insist upon the use of du Pont dependable blasting accessories.

Du Pont Blasting Machines—The du Pont Company makes several sizes of Blasting Machines having capacities of 1 to 150 Electric Blasting Caps fitted with copper wires. The most popular sizes are the Pocket Blasting Machine and Nos. 3 and 4.



Blasting Machine

The No. 3 Blasting Machine is illustrated to the left. The Pocket Blasting Machine also is shown on this page.

Blasting Machines Nos. 3 and 4 fire 30 to 50 copper wire electric blasting caps. They weigh 25 and 42 pounds, respectively. The machines are compact, as shown in the illustration, easy to operate and portable. The No. 3 Blasting Machine is the standard size for quarry and mine. No. 4 is popular for large quarry blasts.

The Pocket Size fires from one to three electric blasting caps at a time. It has a removable handle to prevent anybody but the shot-firer from firing the charges — a "safety - first" device greatly appreciated by quarrymen and miners. A quick, sharp turn of the handle generates the current which passes through the two terminals seen at the top of the case, and then through leading wires attached to the terminal posts.



Pocket Blasting Machine

So much depends on the blasting machine, that the safest thing to do is to purchase the best.

Galvanometers, Rheostats—Practically indispensable accessories in electric blasting in mine or quarry are the galvanometer and the rheostat illustrated on this page.



The galvanometer is a small, direct - reading ohm - meter used to detect breaks, short



Galvanometer

circuits, and points of high resistance in blasting circuits.

The rheostat is an electric resistance bridge for testing blasting machines.

Electric Detonators. After careful experiments extending over many years, the du Pont



Du Pont No. 8 Electric Blasting Cap—Exact Size

Company has developed the No. 6 and No. 8 Electric Blasting Caps as best fitted for all general work.

The selection of the materials and the care in assembling the parts assure a blasting cap that will give complete detonation. These caps are furnished with wires in lengths varying from 4 to 20 feet. The du Pont Company also manufactures Waterproof Electric Blasting Caps, Delay Electric Blasting Caps and Delay Electric Igniters, and furnishes leading wire and connecting wire. The best results are secured from blasting powder by igniting it in the center and for this purpose the Electric Squib is made.

Du Pont electric detonators are packed in cartons of 50.

Cap Crimpers. The du Pont Company furnishes Cap Crimpers of two types, No. 1 and No. 2. The No. 2 Cap Crimper is also used for cutting fuse. One handle is pointed to serve as a punch for making holes in cartridges.



Cap Crimper

Safety Fuse. Safety Fuse for use with blasting caps is also sold by the du Pont Company, different types being manufactured for dry, damp or wet work, or work under water. It is made in coils of 50 feet and shipped in wooden cases.

Du Pont Explosives Service

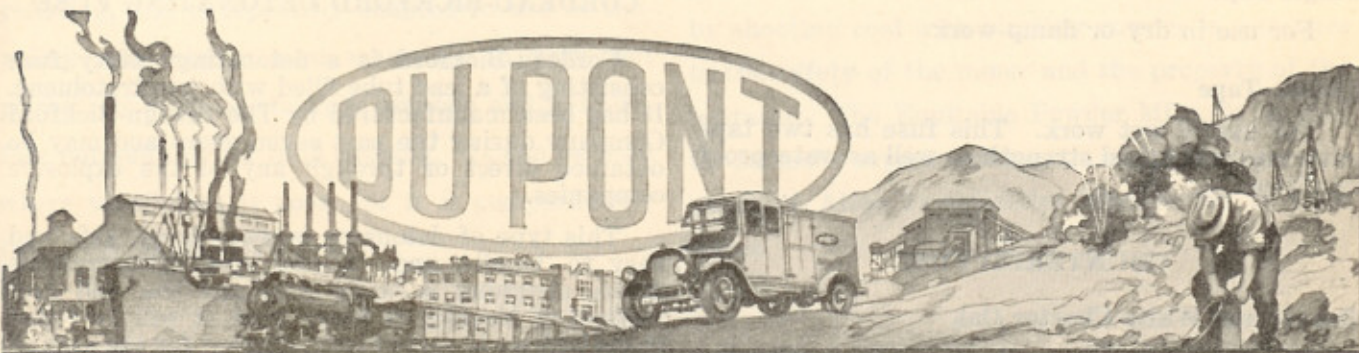
For 121 years it has been the constant aim of the du Pont Company to deliver explosives where they are needed—when they are needed. Today this aim has been achieved by a system of mills and magazines, strategically located near practically every great industrial district.

Prompt delivery is but one factor of du Pont Service. We aim to see that our customers use the kind of explosives that will give the best results for their particular work at least expense—

and that they are handled, stored and used most efficiently.

In short, du Pont Service is the result of a sincere effort on the part of the du Pont Company to meet and follow the demand, and to pass on to the users of their products, in a practical way, the results of their 121 years of experience and research in the manufacture of explosives.

When you buy from du Pont, you buy more than explosives; you buy du Pont Service.



EXPLOSIVES ~ SERVICE

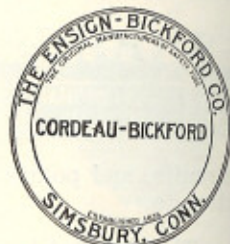
THE ENSIGN-BICKFORD CO.

SIMSBURY, CONN.



Manufacturers of

Safety Fuse For All Purposes and Cordeau-Bickford Detonating Fuse



It is essential for the purpose of safety and economy to purchase a brand of fuse adapted to the work for which it is to be used.

In coal mining, the work may be dry, damp, or wet. Dry work means that the fuse does not come in contact with moisture; damp work means that there is moisture present either in the drill hole or in the tamping material (mud-capping, for instance, is generally classed as damp work); and wet work means that the fuse is actually exposed to the direct action of water in the drill hole.

The standard burning speed of all our brands of fuse at sea level, with the exception of Charter Oak and Clover, is 90 seconds per yard when burned in the open with an allowable variation of 10% either way from standard. Clover and Charter Oak have a standard burning speed of 120 seconds per yard under the above conditions with an allowable variation of 10% either way from standard.

TAPED FUSE

The original waterproof fuses were all of the tape variety. Low temperatures affect the pliability of taped fuse, and in work done on the surface in cold weather the countered fuses such as Beaver, Charter Oak, Crescent, and Clover are best adapted in preference to Single Tape or Double Tape.

Single Tape

For use in dry or damp work.

Double Tape

For use in wet work. This fuse has two tape coverings which add strength as well as waterproof qualities.

COUNTERED FUSE

Beaver and White Charter Oak

For dry or damp work, Beaver or White Charter Oak is quite generally used, Beaver being selected by those who have preference for the ninety second standard speed, and White Charter Oak by those who prefer the slower standard of one hundred twenty seconds per yard.

Gray and Black Charter Oak

Gray and Black Charter Oak are a later development in manufacture which has enabled us to improve the waterproof quality without adding to the cost. Where the requirements for waterproofing are beyond the limits of Beaver or White Charter Oak, we recommend the adoption of Gray or Black Charter Oak.

Crescent, Anchor, Clover

Where the two principal elements are waterproofing and regularity of burning speed, Crescent or Anchor are usually preferred; but where other considerations enter in, such as freedom from side spit, freedom from excessive smoke, and economy of time due to slower burning speed, Clover is preferred because it has even greater waterproof qualities than Crescent, and has, in addition thereto, the above mentioned advantages. The paper tape used on Clover enables the fuse to be subjected to extreme climatic changes and long storage without deterioration. Also, in gaseous coal mines Clover Brand is well adapted on account of its freedom from side sparks.

Avoid lacing, half hitching or the kinking of fuse, especially when the fuse is going to be used in a wet drill hole.

CORDEAU-BICKFORD DETONATING FUSE

Cordeau-Bickford is a detonating safety fuse consisting of a lead tube filled with trinitrotoluene. It has been manufactured by The Ensign-Bickford Company during the past seven years and may be obtained direct or through any of the explosive companies.

This type of detonator is waterproof, safe and easy to handle, and in coal mining operations where stripping is being done and the well drill method of blasting is being used, it will be found that Cordeau is particularly adapted for the setting off of the explosive charges in the drill holes because Cordeau detonates the explosive instantly and completely.

Price lists, sample cards, and further information will be gladly furnished on application.

THE EQUITABLE POWDER MFG. CO.

General Offices
EAST ALTON, ILL.

Mills
EAST ALTON, ILL. MARION, ILLINOIS FORT SMITH, ARK.

Magazines
EAST ALTON, ILL. MINNESOTA TRANSFER, MINN. M'ALESTER, OKLA.
MARION, ILL. PITTSBURG, KAN. FORT SMITH, ARK.
FT. WORTH, TEXAS WACO, TEXAS DALLAS, TEXAS
HOUSTON, TEXAS SHERMAN, TEXAS

Makers of

Alton Explosives

Alton Blasting Powder

For twenty-five years the name "Alton" on a keg of blasting powder has been a guarantee of the quality of the powder, and an assurance to customers of excellent service. **Alton B** Blasting Powder is manufactured in the following standard sizes, running from coarse to fine: CC, C, F, FF, FFF, FFFF. In non-gaseous coal mines the use of **Alton** Blasting Powder will be found the most efficient and economical method of shooting coal.

Alton Dynamite

Alton Nitrolycerin Dynamite is a quick acting powerful explosive for use in hard, tough material where a shattering force is desired. It is low freezing and withstands very cold weather for a long time without freezing.

Alton Gelatin Dynamite is a dense, plastic explosive used in very wet work. It is highly water-resisting, and is especially adapted to use in tunneling and mining hard materials in very wet places. It must be strongly confined and is therefore not suitable for mud capping. It can be used where ventilation is poor, for it is comparatively free from obnoxious fumes.

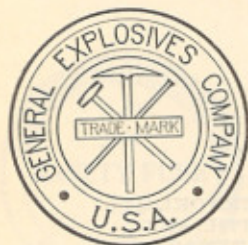
Alton Ammonia Dynamite is a slower acting explosive than the **Alton Nitrolycerin Dynamite** and exerts a heaving rather than a shattering force. It is admirably suited to work in soft material such as earth, sand and clay. It is low freezing and the best explosive for general use the year around.

Alton Permissibles are Government tested mining powders especially suited to mining coal in gaseous and dusty mines, where the flame caused by shooting coal with blasting powder is a menace to the safety of the miner and the property of the operator. The Equitable Powder Mfg. Co. is glad to furnish expert advice to customers on the grade of **Alton Permissibles** most suited to their mines.

Alton Blasting Supplies

The Equitable Powder Mfg. Co. carries a complete stock of all blasting supplies used with explosives. Immediate delivery can be made from distributing magazines, of **blasting machines, leading and connecting wire, safety fuse, blasting caps, electric blasting caps (exploders), squibs, etc.**

GENERAL EXPLOSIVES COMPANY



7 South Dearborn Street
CHICAGO



ST. LOUIS, MO. DENVER, COLO. JOPLIN, MO.
TAMPA, FLORIDA BIRMINGHAM, ALA.

High Explosives
Blasting Powders

Permissible Explosives
Blasting Supplies

PERMISSIBLE EXPLOSIVES



General 1

GENERAL 1—U. D. C. 208—Fumes A. Rate of Detonation 10,650 ft. per second. An exceptionally powerful explosive of medium velocity, adapted to all kinds of hard shooting and particularly for producing coal for coking where the maximum tonnage is desired, as the men can return immediately to the face without loss of time.

The excellent results which are being obtained in the Alabama coal fields, where large quantities are used each month, prove beyond question the economy and reliability of this super-explosive. The increased tonnage per pound of powder and the freedom from objectionable fumes are the two factors which have contributed largely to its success, and have won for it the unqualified approval of both the operators and miners.

Although designed primarily for shooting bituminous coal which is to be made into coke, operators will find it a very economical and serviceable explosive for stripping and blasting out the slate and rock in the development of coal mines of any sort, provided, of course, the work is not too wet.

General 4x

GENERAL 4x—U. D. C. 224—Fumes A. Rate of Detonation 10,760 ft. per second. Very strong, moderate velocity and free from fumes. This powder is the perfected result of years of experimenting and testing in the Anthracite mines of Pennsylvania and we can say positively there is no better explosive on the market for shooting Anthracite coal.

General 3x

General 3x—U. D. C. 230—Fumes A. Rate of detonation 8,950 ft. per second. At first glance one might say that this velocity is a little high to produce the maximum percentage of lump coal, but as not infrequently happens in the case of permissible explosives, the results of numerous tests in the Illinois fields have shown that such is not the case. Laboratory experiments are valuable as indications of what one might expect from an explosive, but only actual use in mines where accurate records are kept over a period of months, will enable one to know positively what the explosive will do.

General 3x has demonstrated its superiority as a lump coal producer. It has been tried in competition with others and has never failed to show results at least equal, if not superior, to its competitors.

General 6x

GENERAL 6x—U. D. C. 220—Fumes A. Rate of Detonation 10,510 ft. per second. Wherever it is found necessary to use an explosive generating a very high pressure, such as in the thick bituminous veins in Illinois, we recommend General 6x. It is remarkably free from fumes and will yield a maximum output containing a fair proportion of lump.

The above powders contain a high percentage of Ammonium Nitrate, and hence should be protected from undue exposure to moisture. A 50-lb. case contains about 135 1 $\frac{1}{4}$ x8" or 102 1 $\frac{1}{2}$ x8" cartridges. A 25-lb. case contains about 48 1 $\frac{3}{4}$ x6" cartridges. (See cut on opposite page.)

HIGH EXPLOSIVES



GENERAL NITROGLYCERIN DYNAMITE is the old reliable "Nitro" powder compounded on scientific principles so as to produce the maximum results. It is very quick and shattering in action

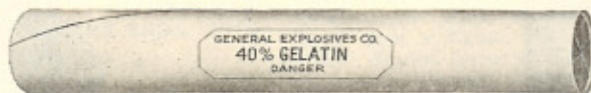
and is used for mud capping and for blasting extremely hard rock.

Made in both high and low freezing grades and in strengths ranging from 15% to 60%. A 50-lb. case contains about 100 1 1/4x8" cartridges.



GENERAL SPECIAL (Ammonia) DYNAMITE is a very efficient and economical explosive for mining and quarrying both above and below ground, except where extreme shattering is required. It produces but little fumes and can be used wherever moderately good ventilation exists.

Made in both high and low freezing grades. Most mines, however, prefer to use the low freezing grade in winter and some use it the year round. Made in strengths from 20% to 60%. A 50-lb. case contains about 100 1 1/4x8" cartridges. (See cut below.)

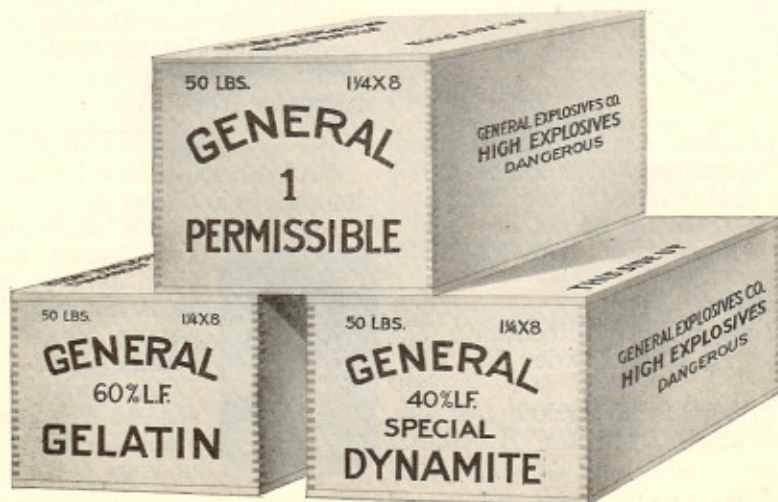


GENERAL GELATIN is without any question the most satisfactory explosive on the market for underground work. Its plastic consistency, which facilitates loading in uppers, and its freedom from fumes, have made it invariably the favorite wherever used. Long experience in the powder business combined with expert technical knowledge of

the requirements has enabled us to accomplish these results.

It withstands water better than any other form of explosive and is made in both high and low freezing grades in strengths from 25% to 90%. A 50-lb. case contains about 85 to 90 1 1/4x8" or 100 to 105 1 1/8x8" cartridges. (See cut below.)

QUALITY



SERVICE

HERCULES POWDER CO.

WILMINGTON, DELAWARE

BRANCH OFFICES

Allentown, Pa.
Birmingham, Ala.
Buffalo, N. Y.
Chattanooga, Tenn.
Salt Lake City, Utah

Chicago, Ill.
Denver, Colo.
Duluth, Minn.
Hazleton, Pa.

Salt Lake City, Utah

San Francisco, Cal.

Huntington, W. Va.
Joplin, Mo.
Little Rock, Ark.
Los Angeles, Cal.

Louisville, Ky.
Memphis, Tenn.
New York City
Norristown, Pa.
Wilkes-Barre, Pa.

Pittsburg, Kan.
Pittsburgh, Pa.
Pottsville, Pa.
St. Louis, Mo.
Wilmington, Del.

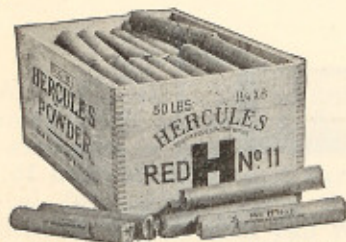
Explosives and Blasting Supplies

HERCULES PERMISSIBLE EXPLOSIVES

The Hercules Powder Company manufactures high grade permissible explosives that have passed the rigid tests of the Bureau of Mines, and have been accepted by the United States Government as permissible for gaseous and dusty coal mines. These explosives are manufactured in a series covering a wide range of strengths and speeds, so as to meet the varying conditions found in different coal mining districts.

Red H

Hercules Red H is listed by the United States Bureau of Mines as a permissible powder for coal mining. On account of their bulkiness, different Red H grades average about one-third more cartridges of a given size to the case than equivalent grades of dynamite.



Red H No. 6 is a strong, quick permissible. Red H No. 4 A. L. F. is a weaker powder of medium velocity.

Red H No. 5 is slower than Red H No. 4 and where it can be used it is the best for producing the maximum percentage of lump coal.

Red H is packed in standard cartridges, 50 pounds to the case.



Collier B

Collier B is an ammonium nitrate permissible with high strength and quickness. It is a high cartridge count explosive, and where suited for the work, is very economical because of its low cost per cartridge. It runs more than 300 1 1/4"x8" cartridges per 100 lbs.

Other Hercules Permissibles

The list includes Bituminite 1, Bituminite 5, Collier 5 Special, Collier 11, Coal Powder B, Coal Special 3C.

A table giving the strength and quickness of all permissibles can be obtained from the Hercules Powder Co.

NON-PERMISSIBLE HIGH EXPLOSIVES

Hercules Special No. 1

Because of its high cartridge count and low cost per cartridge, Hercules Special No. 1 is more economical on work for which it is suited than ordinary dynamite. There are about 1/3 more cartridges of Special No. 1 in a box than there are of ordinary dynamite in the same size cartridges. Hercules Special No. 1 frequently replaces 40% dynamite, cartridge for cartridge, at a saving of approximately 25 percent. Special No. 1 is a "bulky" explosive, hence not as good as gelatin where a concentrated charge is desired, as in tunnel driving in hard tight rock; however, for quarrying, stripping, road building, and some underground work it is both effective and economical.



Hercules Gelatin

Hercules Gelatin is good for wet work, or for use where ventilation is poor. Its plasticity enables it to be loaded easily and effectively in holes having an upward slant, and the density and plasticity make it extremely well adapted for tight blasting in hard rock, such as tunnel driving, shaft sinking, etc. It is made in strengths from 25% to 75%.

It is packed in standard cartridges, 50 lbs. to the case.

Hercules Extra Dynamite

Hercules Extra (Ammonia) Dynamite is a good explosive for most blasting purposes. It is less expensive than Gelatin or Straight Nitroglycerin dynamites, but not as water resisting. It is made in strengths from 15% to 50%.

BLASTING POWDERS

"A" Blasting Powder is for use in dimension stone, slate and granite quarries.

"B" Blasting Powder is for use in non-gaseous coal mines, coal stripping, quarry, and construction work. It is manufactured in all sizes of grains, glazed and unglazed. From FFFF, about 1/16-inch diameter, to CCC, about 3/4-inch diameter. A special granulation called Herco is made for Hercoblasting. It is packed in kegs containing 25 lbs. net.

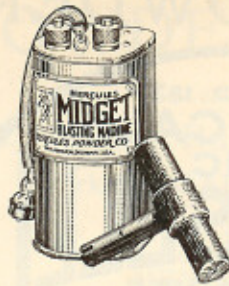


Write for Booklet on "Scientific Selection of Explosives for Coal Mining"

HERCULES BLASTING SUPPLIES

Hercules Blasting Machines

An apparatus for generating electric current used in firing electric blasting caps, squibs, and igniters. The Hercules 1 to 50 cap capacity Machine has fired many more electric blasting caps connected in series, but we do not recommend using over 50 caps in a series connection, under proper working conditions.



The Hercules Midget Machine is rated to fire up to five electric blasting caps, connected in series, which allows ample power reserve.

Blasting Machine	Capacity
Midget—Pocket Size.....	5 Electric Blasting Caps
Hercules No. 2.....	10 Electric Blasting Caps
Hercules Blasting Machine.....	50 Electric Blasting Caps

Galvanometers

A reliable and compact instrument for testing electric blasting circuits, electric blasting caps, and for locating breaks, short circuits, faulty connections, etc. Weight 1 pound.



Hercules Rheostats

A small instrument offering the easiest and most effective means of testing the strength of a blasting machine without actually firing a series of electric blasting caps. This instrument gives a resistance equal to from 5 to 100 electric blasting caps, with 30 ft. copper wires.



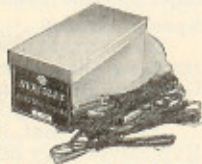
Electric Blasting Caps

These are used to detonate charges of high explosives by means of electricity. They are made in two strengths, No. 6 and No. 8. These are provided with insulated copper wires from 4 to 30 ft., or with iron wires from 4 to 8 ft. Packed 25 or 50 to the carton, 10 cartons to the case.



Electric Squibs

Hercules Electric Squibs are similar in appearance to Electric Blasting Caps, and are used to fire charges of Blasting Powder. The advantages of Electric Squibs are that more than one shot may be fired at one time, resulting in a saving of both powder and time. They are safer and may be placed in the center of the charge, resulting in complete combustion, giving quicker and stronger action with less smoke. Electric Squibs are made with 4 to 8 ft. iron wires and 4 to 30 ft. copper wires. Packed 25 and 50 to the carton, 10 cartons to the case.



Delay Electric Blasting Caps

These are made in two delays. Three different periods can be obtained by using regular Electric Blasting Caps in the same circuit. Delay Electric Blasting Caps are made with copper wires 4 to 30 ft. Packed 25 and 50 to the carton, 10 cartons to the case.



Delay Electric Igniters

These are made in six delays and are used for firing charges of black powder in rotation. If desired, blasting caps may be crimped on the end of the igniter and used for rotation firing of high explosives. Made with wires 4 to 20 feet. Packed 50 to a carton, 10 cartons to a case.

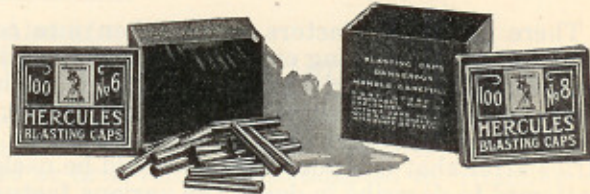
Leading Wire

Hercules Leading Wire is an insulated copper wire (No. 14 B. & S. gauge) used for connecting electric blasting caps to the blasting machine. It is furnished in coils from 200 ft. to 500 ft.



Connecting Wire

Hercules Connecting Wire is used to join the wires of electric blasting caps. It is a high grade insulated copper wire (No. 20 B. & S. gauge), and is put up in one and two pound spools.



Blasting Caps

Blasting Caps are used to detonate charges of high explosives. As the efficiency of any high explosive depends on the initial shot, we do not recommend caps smaller than Hercules No. 6.

Standard sizes Nos. 6 and 8. Packed 100 in a box, 5 to 50 boxes in a case.

Miners' Squibs

Squibs are used for firing charges of Blasting Powder. "Artificial straw" and "Rocket" Squibs burn with a flame. "Chinese" or "Gas" Squibs burn with an ember, no flame. Packed 100 to the box, 100 boxes in a case.



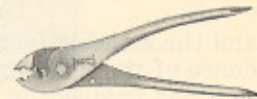
Safety Fuse

We are not manufacturers of Safety Fuse. We purchase and sell the various standard brands of Safety Fuse as manufactured in this country. The manufacturers of Safety Fuse give an estimated burning speed for every brand. Fuse is packed in coils of 100 ft. Cases contain from 5 to 60 coils.



Cap Crimpers

Hercules Combined Fuse Cutter and Cap Crimpers are especially constructed pliers made for the purpose of fastening blasting caps securely to fuse. They are equipped with a special fuse cutter, and one handle is made round and pointed for punching holes in sticks of dynamite in which the detonators are placed. These crimpers are nickel-plated, packed in cartons, 12 to the box.



Blasting Paper

Hercules Blasting Paper is a tough moisture resisting paper used for making cartridges of blasting powder. It comes in rolls 9 to 12 inches wide. These weigh respectively 4½ and 6 lbs.



Tamping Bags

Hercules Tamping Bags are made of heavy water resisting paper. They are very convenient and inexpensive. Made in sizes from 1"x8" to 2"x18". Packed in bales containing 5,000.

Other Blasting Supplies

Delay Action Electric Exploders; Cordeau Bickford Detonating Fuse; Storage Magazines; Thawing Kettles.

Consult with the Hercules Service Division on All Your Blasting Problems. For Further Detailed Information Write for Our Book, "Hercules Products"

THE GRASSELLI POWDER COMPANY

CLEVELAND, O.
 PITTSBURGH, PA.
 BLUEFIELD, W. VA.
 NEWCASTLE, PA.
 CLARKSBURG, W. VA.
 BROWNSVILLE, PA.



PHILADELPHIA, PA.
 CHICAGO, ILL.
 BIRMINGHAM, ALA.
 HAZLETON, PA.
 POTTSVILLE, PA.
 WILKESBARRE, PA.

There are many factors to be taken into consideration when choosing explosives for coal mining purposes, such as height of seam, texture of coal, system of mining, position and size of binder, if any, kind of coal desired, condition of rooms or entries after shot is made, etc. It would be useless to attempt to describe in detail the various features of our powders in regard to these conditions which vary so greatly, but we are ready at all times to have one of our representatives call at your operation and go over your proposition with you, whether it be shaft sinking, driving a tunnel, size of coal produced, or explosives cost.

Permissibles

In the years past we have developed and obtained approval of Bureau of Mines as to permissibility of use in gaseous and dusty mines, of a great many permissible powders, but after exhaustive study and tests in actual field operations by our blasting experts, who are technically trained and practical coal miners, it was found that we now have a half-dozen powders possessing all the qualities necessary to meet the peculiar requirements of the various coal fields east of the Mississippi.

We have specialized in

Grasselli No. 1
 Grasselli No. 5
 Grasselli No. 6
 Grasselli 2 LF
 Grasselli 5 LF
 Grasselli 6 LF

and the steadily increasing demand for them is evidence of the uniform high quality this standardization has enabled us to embody in them. The first three mentioned (which were originally known as Cameron 1-A, Mineite 5-D and Mineite 6-D) are the ones our success in coal fields has been based upon. The others are of more recent development and wherever tried have always given the expected results.

Each one of Grasselli permissibles is distinctive as to execution and so balanced as to insure a maximum of energy properly applied to the coal. With these powders, once the proper placing of shots and quantity of charge is determined, no further experimenting is necessary.

Grasselli No. 1 and Grasselli 2 LF

Of quick hard-hitting action especially adapted to production of coking coal and for shooting coal of extremely hard texture. Also very effective in rock work.

Grasselli No. 5 and Grasselli 5 LF

Most desirable and economical powders where coal is not of extremely hard texture. They are ideal lump coal producers, the strata of the lumps being preserved so it will stand rough handling of cars in transit.

Grasselli No. 6 and Grasselli 6 LF

These two powders are not quite so speedy as the other four Grasselli permissibles, but of enormous pressure. They are so balanced as to speed, strength and expansion to make them especially adapted to production of lump coal in certain districts.

Dynamites

The Grasselli Powder Company's dynamites, as well as permissible powders, are sold under the Grasselli trade mark, which is stencilled on each cartridge and box.

Ammonia Grade

Of great heaving and spreading power. For all around work. Made in strengths from 20% to 60%. A recent addition to the many advantageous features of Grasselli Ammonia Dynamite is its ability to withstand the effects of wet bore holes.

Nitro Glycerin Grade

Of powerful, concentrated and hard-hitting action.

Gelatin

For sinking shafts, driving tunnels and other rock work. Will shoot when submerged in water, and is free from objectionable fumes.

Special Grades

When an explosive not quite as strong as dynamite, but stronger than black powder, is required, our special grades, Grasselli F, FF, and FFF are recommended. They are of graduated strengths, put up in cartridge form.

All LF (that is low freezing) grades of Grasselli High Explosives may be relied upon to withstand the lowest temperature conditions.

"B" Blasting Powder

For use in mines that are not gaseous.

Formulas followed in the manufacture of the various brands of black blasting powder differ only slightly, but the methods and thoroughness of treatment of the ingredients vary to a great extent. Grasselli brand powder is made of carefully selected raw materials, thoroughly incorporated, hard pressed and well glazed, insuring a maximum energy. It is put up in seven sizes of granulation, ranging from CCC, which is of a slow heaving and lifting action, to 4 F, for shooting hard coal, requiring a sharp, quick action.

Blasting Supplies

A complete stock of blasting supplies, such as fuse, caps, electric caps, blasting machines, cables, etc., is also carried.

SPECIAL SERVICE

The work of the members of the Grasselli Service Staff is to co-operate toward obtaining the best possible results from explosives, and insuring the greatest safety to your men. One of them will call at your request.

ILLINOIS POWDER MFG. COMPANY

General Offices

1548-51 Pierce Building, ST. LOUIS

Works: GRAFTON, ILLINOIS

Steger Bldg., 28 E. Jackson Bl.
CHICAGO

Branch Offices
1419 Central Bank Bldg.
MEMPHIS, TENN.

309-310 Victor Bldg.
KANSAS CITY, MO.

And Many Other Distributing Points

Makers of

"Black Diamond Permissibles"

Manufacturers Also of

"GOLD MEDAL" DYNAMITE AND BLASTING SUPPLIES—BLASTING POWDER

"BLACK DIAMOND" No. 2-A

A Nitro-Glycerin Base Permissible of medium velocity, best adapted to work where a fairly active powder is required. Especially recommended where vein of coal is firm or hard.

Put up usually in 50 pound boxes of 1 1/4 x 8 inch sticks, 135 to 140 per box. Can also be furnished in larger sizes if desired.

Not low freezing.

"BLACK DIAMOND" No. 3-A

Slower than No. 2-A, but also a nitro-glycerin base powder. Recommended where a large percentage of lump coal is wanted.

Put up in 1 1/4 x 8 inch sticks in 50 pound boxes containing 135 to 140 sticks per box. Larger sizes furnished if desired.

Not low freezing.

"BLACK DIAMOND" No. 5

A high grade ammonia base permissible powder, very slow acting, and especially recommended where lump coal is wanted.

Made in 1 1/4 x 8 inch sticks usually, put up in 50 pound boxes containing 135 to 140 sticks per box. Larger sizes furnished if wanted.

Not low freezing.

"BLACK DIAMOND" No. 6-LF

A nitro-glycerin base permissible much slower than No. 3-A and especially recommended where a large per cent. of lump coal is desired. Being low



freezing, it can be used without throwing attention, at much lower temperatures than either No. 2-A or No. 3-A.

Put up in 1 1/4 x 8 inch sticks, 135 to 140 sticks to the 50 pound box. Larger sizes furnished if desired.

"BLACK DIAMOND" No. 7

A high grade ammonia base powder of medium velocity, considerably quicker than No. 5, and best

used where a fairly active powder is needed, in hard or firm veins. Also adapted to trimming and blasting out the "bone" in coal mining.

Put up in 1 1/4 x 8 inch sticks, 135 to 140 to the 50 pound box. Larger sizes if desired.

(This grade is also low freezing.)

Special "I. P. Mfg. Co." Sticks

The Illinois Powder Mfg. Co. originated a size of 1 3/4 x 6 inch sticks, each weighing one-half pound, and these have become very popular for certain uses. Packed usually in 50 pound boxes of 100 sticks each. All of the Company's brands may be had in this special size if ordered thus. Shipments are made of the 1 1/4 x 8 inch size, however, unless orders call for the newer size. Care should be taken to specify size in order to prevent delays or errors in filling requirements. Twenty-five pound boxes of the 1 3/4 x 6 inch size, as well as other sizes, can be furnished where required at a small additional charge.



Blasting Supplies

The Illinois Powder Mfg. Co. carries a complete stock of Blasting Machines, Blasting Caps, Safety Fuse, Cordeau-Bickford Detonating Fuse, Electric Blasting Caps, Leading and Connecting Wire, Thawing Kettles, and all other Blasting Supplies. Every order is given careful and prompt attention. Your requirements are solicited.

Storage

All explosives should be stored in dry, well ventilated magazines. This is especially required in the case of Permissible Powders of Ammonia Base such as Black Diamond No. 5 and No. 7. This class of explosives is quickly affected by moisture and rendered less effective thereby.

For complete detonation of all Permissibles use a No. 6 Blasting Cap or No. 6 Electric Blasting Cap.

PEERLESS EXPLOSIVES COMPANY

Incorporated

Offices

Wilkes-Barre, Pa.

Pittsburgh, Pa.

Huntington, W. Va.

Manufacturers of

PEERLESS EXPLOSIVES

Permissible Explosives, Dynamite, Blasting Powder and Blasting Supplies

Peerless Explosives were formulated only after years of research and study of the very many factors that govern the safe and economical production of coal. Velocity of detonation, strength, spread of explosive energy, and thoroughness of detonation—all govern the effect on material blasted, and are controlled by the superior and highly standardized methods we employ.

A grade and strength to fit your particular conditions and requirements will be found in the Peerless Assortment.

Permissible Explosives

So named because they have been approved by the U. S. Bureau of Mines for use in gaseous and dusty mines. Our success is indicated, not alone by the ever growing demand for Peerless Permissibles, but by the further fact that many miners insist on them, even in mines where mining laws do not require permissible explosives to be used.

Peerless No. 1—A strong, quick acting explosive, particularly suited to the production of coking coal or shooting coal of very hard texture. It is used in mines in place of dynamite for rock work. It is low-freezing and averages about 300 cartridges 1¼x8 inches per 100 pounds.

Peerless No. 2—The permissible that insures the greatest percentage of lump coal—coal that withstands rough handling and is "lump" when it reaches the consumer. It is low in velocity and of great strength. It has a more spreading and lifting action than Peerless No. 1, and its unusual balance has caused it to be called the nearest thing to black powder yet developed in a permissible explosive.

Dynamite

Efficient preparation of raw materials in process is reflected in the finished product. The most modern and efficient machinery and equipment in use at our plant insures a dependable, uniform quality, so that once the placing of holes and size of charge has been determined, no further experimenting is necessary.

Gelatin Grade

For driving tunnels, sinking shafts and other rock work where fumes are a consideration. A very dense, water resisting explosive. It is low-freezing and is made in strengths from 25% to 100%.

Nitro-Glycerin Grade

Of very quick, concentrated and shattering action. Very effective for outside work in hard-shooting rock. Made both high and low-freezing, and in strengths from 5% to 60%.

Ammonia Grade

Has a great spreading and heaving power, and is particularly adapted to headings, strippings, cuts and all around blasting that is not gaseous. Though not classed as a water-proof explosive, special treatment affords considerable protection when loaded in holes containing moisture. Made in strengths from 15% to 60% and is low-freezing.

Blasting Powder

Recommended for use in mines that are free from gas and coal dust. Made in granulations ranging from CCC, providing a slow, heaving action, to FFFF, which affords a quick, shattering action. Sizes are selected according to local conditions and sizes of coal desired.

The careful selection and standardized preparation of raw materials that enter into Blasting Powder, are responsible for the steadfast demand for Peerless Brand. The bright glaze, causing the powder to be free-running, and the uniformity of grains, which insures uniform blasting, are outstanding features.

Blasting Supplies

In addition to the above products, we carry ample stocks of the following commodities at numerous distributing points located in the various coal mining sections east of the Mississippi river.

- Blasting Caps.
- Electric Blasting Caps.
- Blasting Machines.
- Delay Electric Igniters.
- Leading Wire and Cables.
- Connecting Wire.
- Safety Fuse.
- Rheostats.
- Galvanometers.
- Magazines.
- Magazine Locks.
- Electric Squibs.
- Tamping Bags.